

Onan

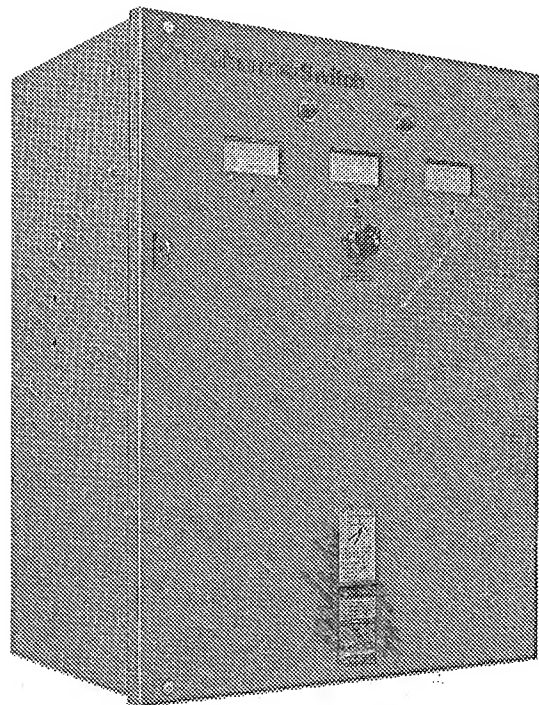
Service Manual

LT II

Switch

Starting Spec G

**Utility-to-GenSet
Automatic Control**



913-0502

5-88
Printed in U.S.A.

6359

Safety Precautions

Before operating the transfer switch, read the Operator's Manual and become familiar with it and your unit. **Safe and efficient operation can be achieved only if the transfer switch is properly operated and maintained.** Accidents are caused by failure to follow fundamental rules and precautions.

Throughout this manual you will observe symbols, shown below, which indicate potential dangers to the operator, service personnel, or the equipment itself. Read the manual carefully and know when these conditions exist. Then take the necessary steps to protect personnel and the equipment.

⚠ DANGER *This symbol warns of immediate hazards which will result in severe personal injury or death.*

⚠ WARNING *This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.*

⚠ CAUTION *This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.*

ELECTRICAL SHOCK WILL CAUSE SEVERE PERSONAL INJURY OR DEATH.

The automatic transfer switch has components with high voltages which present serious shock hazards. For this reason, read the following suggestions.

- Keep the automatic transfer switch cabinet closed and locked. Make sure only authorized personnel have the cabinet keys.
- Before performing maintenance or making adjustments, move the operation selector switch on the generator set or automatic transfer switch to STOP. Then disconnect the starting batteries [(-) lead first] of the generator set and remove AC line power from the automatic transfer switch. If instructions state otherwise, use extreme caution due to the danger of shock hazard.
- Use rubber insulating mats placed on dry wood platforms over floors that are metal or concrete when working on any electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.
- Jewelry is a good conductor of electricity and should be removed when working on the electrical equipment.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.
- Copy and post these suggestions in a prominent area of the transfer switch.

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Section 1. General Information

ABOUT THIS MANUAL

This manual provides service information specific to Onan LT II series transfer switches. Both standard and option variations are included in subjects covered. When performing troubleshooting, adjustment, and repair procedures, remember the transfer switch, generator set, and commercial power are all interdependent. The serviceperson must therefore possess thorough knowledge of transfer switch principles, and basic knowledge of electrical fundamentals.

During periods of normal operation, read all service and operating instructions applicable to your site equipment. This will allow you to more effectively remedy a fault condition when it occurs. When performing any service procedures, observe all cautions and warnings in this manual and on transfer switch.

The transfer switch must always maintain compliance with any applicable codes and standards. Improper servicing can create an unsafe installation that might cause serious personal injury or death, or damage to the equipment.

MODEL NUMBER SYSTEM

Always supply the complete **Model number**, **Spec number**, and **Serial number** as shown on the transfer switch nameplate (Figure 1-1) when contacting an Onan Dealer or Distributor. This information is necessary to identify your transfer switch when ordering replacement parts.

The following two pages show the model numbering system for starting spec H units and the older spec G units. A typical model number is given for each spec and the meaning of the code segments.

Onan Transfer Switch	
Model	
Serial	
Volts	PH
Amps	Hz
Mot.L.R.Amps	Wire

Suitable for control of motors, electric discharge lamps, tungsten filament lamps and electric heating equipment where the sum of the motor full-load ampere ratings and the ampere ratings of other loads do not exceed the ampere rating of the switch and the tungsten load does not exceed % of the switch rating.

For Elec Eqpt Only

Onan Corporation
Minneapolis Mn 55432 USA
Made in USA 99 1269

M-1613

FIGURE 1-1. NAMEPLATE

⚠ WARNING

INCORRECT SERVICE OR REPLACEMENT OF PARTS CAN RESULT IN SEVERE PERSONAL INJURY, DEATH OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE.

SPEC H MODEL NUMBERING SYSTEM

LT	C	U	200	A	/	39	H
1	2	3	4	5	6	7	

4. Continuous Ampere Rating

30, 60, 100, 200

5. Voltage Codes

A = 120V, 60 Hz

L = 120/208V, 3Ø, 4-Wire

240V, 1Ø, 3-Wire 60 Hertz

240V, 3Ø, 4-Wire

480V, 3Ø, 4-Wire

Z = 200/347V, 3Ø, 4-Wire

220/380V, 3Ø, 4-Wire 50 Hertz

240/416V, 3Ø, 4-Wire

H = 347/600V, 3Ø, 4-Wire 60 Hertz

6. Factory code for optional equipment

7. Specification Letter (Advances with production modification)

1. Series Identification

2. Basic Application

C = 2-Wire Start

E = 3-Wire Start

3. Agency Certification

U = UL

C = CSA

N = None

SPEC G MODEL NUMBERING SYSTEM

LT	B	C	A	100	-	39	U	/	260	04	G
1	2	3	4	5		6	7		8	9	10

1. Series identification
2. Transfer switch type
B = 3 Pole, Elec. Held
G = 3 Pole, Mech Held Line Side
L = 3 Pole, Mech Held Both Sides
3. Basic Application
C = GenSet Standby to Utility (2-wire start)
E = GenSet Standby to Utility (3-wire start)
4. Enclosure
A = General purpose (NEMA 1)
5. Continuous Ampere Rating
30, 60, 100, or 200

6. Voltage Codes

60 Hz	50 Hz	Voltages
1	51	120V, 1Ø, 2-wire
39	539	120/208V, 3 Ø, 4-wire
		120/240V, 1Ø, 3-wire
		120/240V, 3 Ø, 4-wire
38	538	277/480V, 3Ø, 4-wire
		200/347V, 3Ø, 4-wire
		220/380V, 3Ø, 4-wire
9X	59X	240/416V, 3Ø, 4-wire
		347/600V, 3Ø, 4-wire

7. Agency Certification

- U = Underwriters' Laboratories, Inc.
C = Canadian Standards Association
N = None

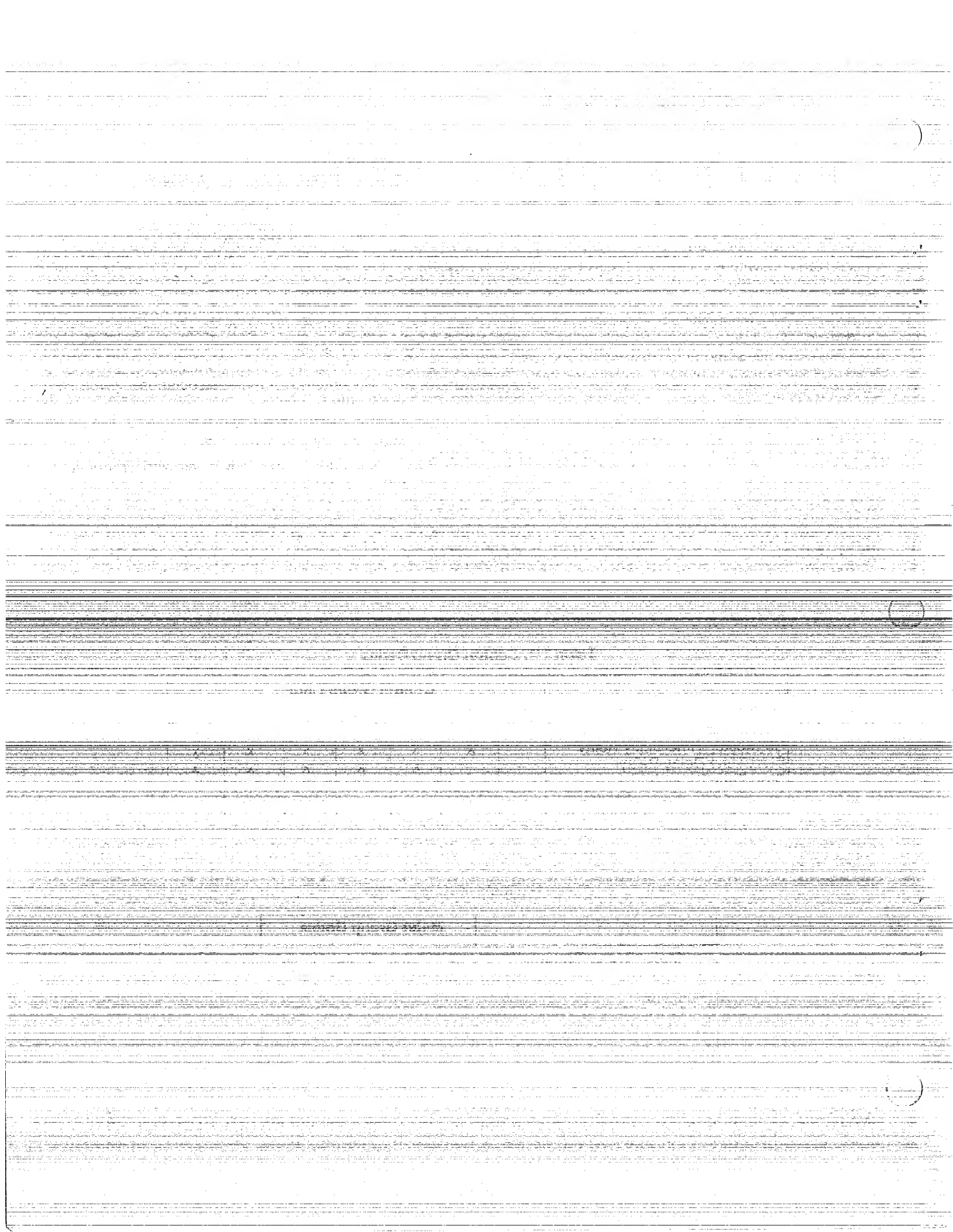
8. Control Group (see Table 1-1)
9. Meter Group (see Table 1-2)
10. Specification Letter (advances with production modifications)

Table 1-1. Control Group Codes

Control Group Features	Control Group Code						
	260	261	262	263	264	265	266
Phase Loss/Gen Pickup Relays	X	X	X	X	X	X	X
Retransfer Time Delay Relay		X	X	X	X	X	X
Start Time Delay Relay			X	X	X	X	X
Stop Time Delay Relay				X	X	X	X
Transfer Time Delay Relay					X	X	X
Adj. Volt. Sensor - 1-Phase Line							X
Adj. Volt. Sensor - 3 Phase Line						X	

Table 1-2. Meter Group Codes

Meter Group Features	Meter Group Codes			
	02	03	04	05
AC Voltmeter	X	X		
Ammeter		X		
Frequency Meter		X		X
Running Time Meter	X	X	X	X



Section 2. Operation Description

GENERAL

This section describes the operation of the LT II transfer switch. The descriptions will include all standard, and most optional model variations. Refer to Model Number System and any other modifications specific to your installation requirements to properly interpret the following information.

The cabinet door may also include one or more of the following options:

- AC Voltmeter (M3)
- AC Ammeter (M4)
- AC Voltmeter/Ammeter Selector Switch (S3)
- Frequency Meter (M5)

COMPONENT DESCRIPTIONS

Cabinet Exterior

As a standard, the cabinet assembly has Normal and Emergency operating status lamps, and a lockable type door hasp. See Figure 2-1.

The transfer switch cabinet door should be closed at all times, and only authorized personnel be allowed entrance.

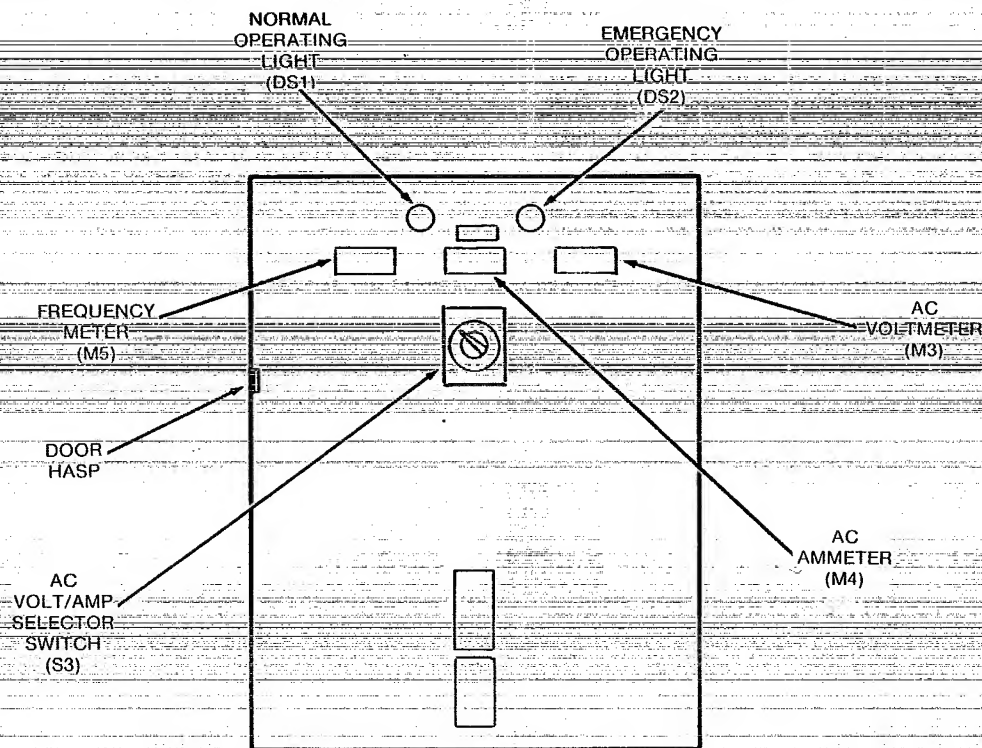


FIGURE 2-1. COMPONENT LOCATIONS - EXTERIOR

Cabinet Interior (Figure 2-2)

Transfer Switch Assembly: The transfer switch assembly consists mainly of three pole relays K1 and K2. These relays transfer loads between Normal and Emergency power sources. The relays are electrically and mechanically interlocked to prevent simultaneous application of both power sources to the load. When closed to either Normal or Emergency power, the relay contacts are either electrically or mechanically held. Operation of the transfer switch assembly is dependent upon the control assembly.

Current Transformers: For transfer switches equipped with the AC ammeter option, the generator set wires to K2 must be routed through current transformers CT1, CT2, and CT3 as indicated on the wire diagrams.

Program Transition: Programmed transition relay (K20) is an optional feature of transfer switches (mechanically latched both sides only). Programmed transition is the capability of the transfer switch to assume a mid-transition position, for an adjustable interval of time, when the load is neither connected to the Normal power source, nor to the Emergency power. This feature allows residual voltages in a motor load to decay to an acceptable level before transition is completed. The length of time that the transfer switch is in the mid-position can be adjusted from 0.5 to 5 seconds, 1.5 to 15 seconds, or 5 to 50 seconds depending on the timer option. The proper adjustment is a function of the motor and its connected load.

Battery Charger: The battery charger (A2) regulates its charge voltage to continuously charge without damage to the battery. As the battery approaches full charge, the charging current automatically tapers to zero amperes or to steady-state load on the battery. The battery charger has an ammeter for indication of charging current and has a fuse for protection of the battery charger circuit. The 0 to 2.0 ampere maximum charging rate is adjustable, and switch selectable to charge either 12- or 24-volt starting batteries.

⚠ WARNING

There is a possibility of battery damage and personal injury if charger is not properly set. Refer to Section 3 - Adjustments, for adjustment procedures and safety precautions.

Exerciser Clock: Onan recommends that the generator set be operated for 30 minutes each week to remove moisture and to keep a film of lubricating oil on the engine parts. Exercising for one long period is better than several short periods. The normal exercise period is from 12:00 to 12:30 p.m. on Saturdays. The exerciser program may be changed using the procedure in the *Adjustments* section.

The contacts in the exerciser clock are basically a single-pole double-throw switch. When the clock switch is activated, the contacts close and send a start signal to the generator set.

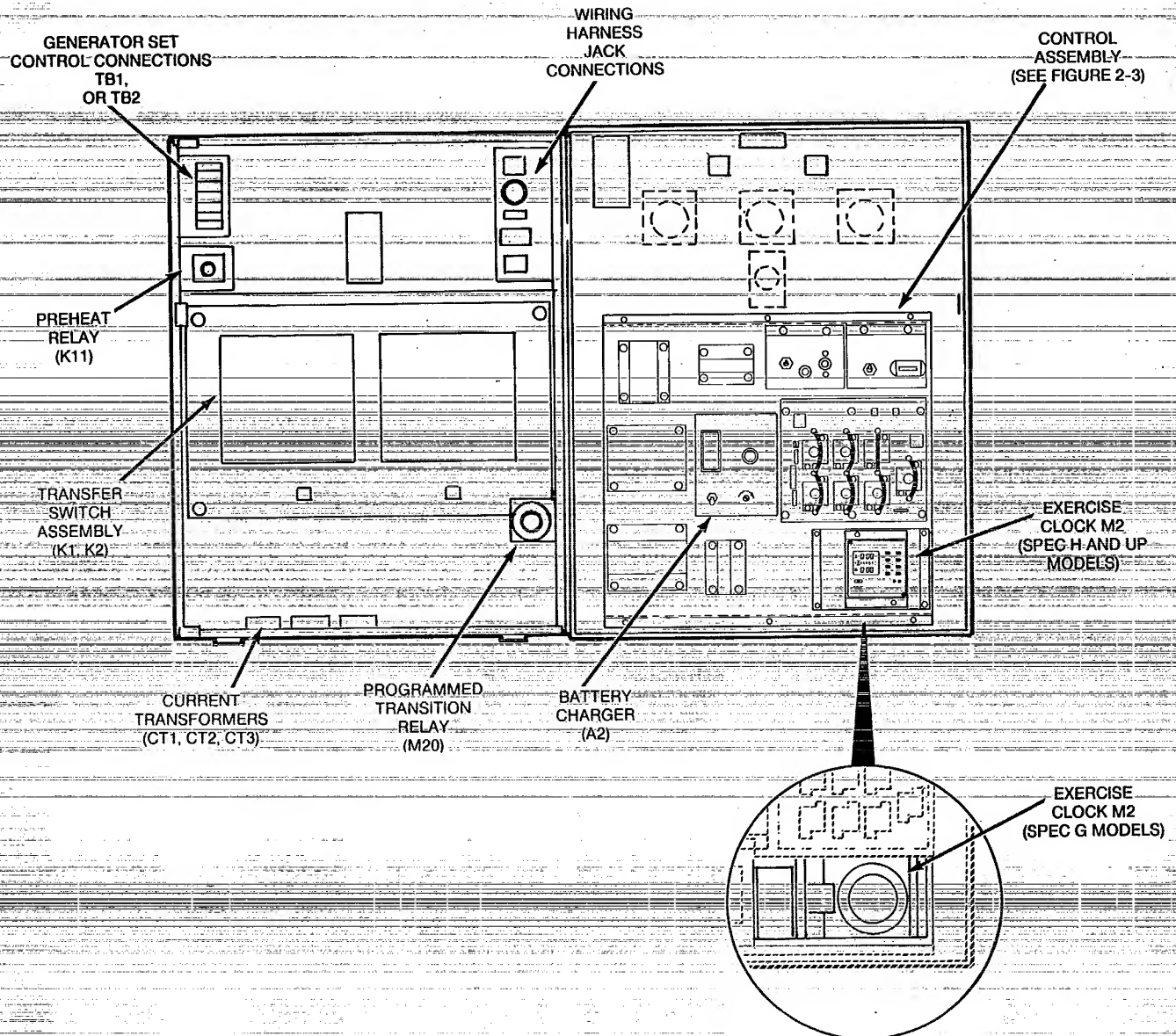
Transfer switches rated above 120 VAC use a step-down transformer (T1) to furnish 120 VAC to the exerciser clock. Transformer T1 is located inside the cabinet in the upper left corner of the control plate assembly.

Wiring Harness Jack Connections: The following briefly depicts the functions provided through each jack/plug-in position.

- J10 - Delayed start/stop of generator set with Pre-heat option (3-wire only).
- J3 - Automatic start/stop of generator set from PCB control A1.
- J12 - Current transformers and meters option.
- J4 - Power supply to controller transformers from line or emergency source, and command actuation of transfer switches K1 and K2.
- J14 - Programmed transition relay option.

Preheat Relay: This relay (K11) provides a time delayed start, for glow plug warm-up of diesel generator sets, adjustable for a 0.6 to 60 second delay.

Generator Set Control Connections: This terminal board is designated TB1 on 3-wire, and TB2 on 2-wire system electrical schematics. It provides control harness wiring interconnect to the generator set.



ES-1602-3

FIGURE 2-2. COMPONENT LOCATIONS - INTERIOR

Control Assembly: The control assembly (Figure 2-3) monitors the Normal and Emergency power sources. If a failure of the Normal power source is detected, the control assembly starts the standby generator set and transfers the load to this Emergency power source. If restoration of the Normal power source, or a failure of the Emergency power source is detected, the control unit transfers the load to the Normal power source and shuts down the generator set.

The following briefly describes the components located on the control plate assembly:

- **Transformer T1** - is interconnected to the battery charger and exerciser clock.
- **Transformers T2 and T4** - are for line side monitoring and control components.
- **Transformers T3 and T5** - are for emergency side monitoring and control components.
- **Connector Panel** - this plug-in connector plate is equipped on models offering reconnectability to other voltages.
- **Generator Selector Switch (S2)** - (3-wire start only). This switch is the operation selector for the generator set. The three positions function as follows:

Auto: allows the generator set to start and assume the load if a power outage occurs. This is the normal operating position.

Hand Crank: prevents the automatic transfer switch from starting the generator set but allows starting and stopping at the set. Use this position for generator set testing.

Stop: shuts down the generator set and prevents it from starting. Use this position when servicing the generator set.

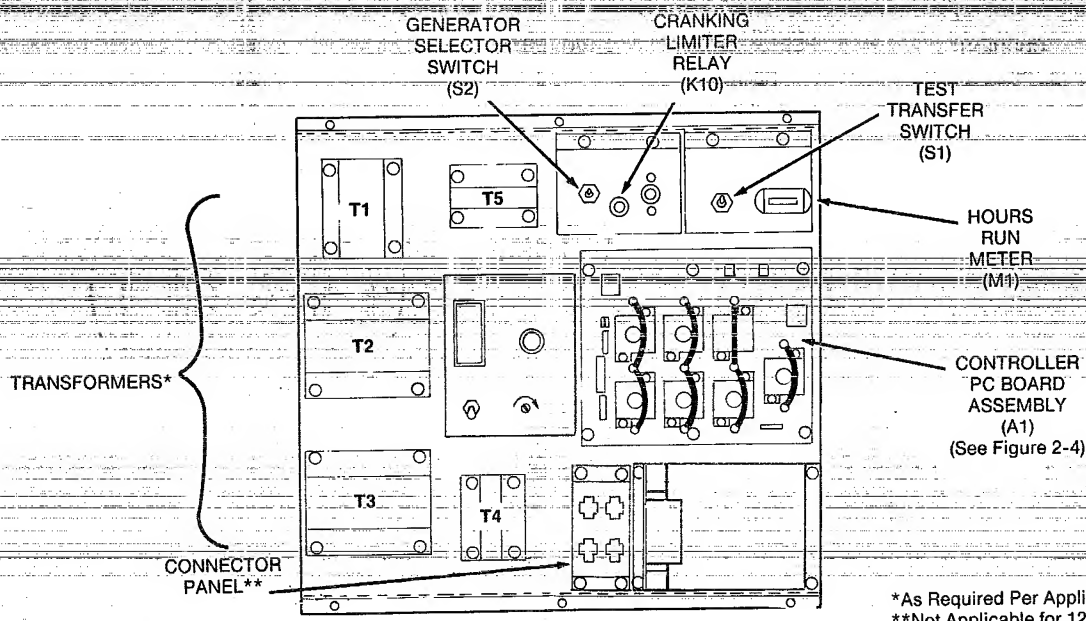
- **Cranking Limiter Relay (K10)** - (3-wire-start only). The cranking limiter is an electrically-operated thermal relay that protects the engine cranking circuit. The limiter is energized until the engine begins to crank and remains energized until the engine starts. If the engine does not start, a heating element in the limiter opens the cranking circuit after approximately one minute. The limiter must be manually reset before the engine will crank again.
- **Test Transfer Switch (S1)** - this three position switch can simulate a power outage for test purposes. The three positions function as follows:

Test: moving the switch to Test sends a start signal to the generator set. The generator set will start and assume load as long as the switch is in this position.

Normal: in the Normal position, the transfer switch is set for automatic operation.

Retransfer: upon completion of test period, moving the switch from Test to Retransfer position causes the load to transfer to normal power source, bypassing the control retransfer time delay. The switch will be spring returned to Normal position upon release.

- **Hours Run Meter (M1)** - this meter advances while the generator set is in operation. It provides an ongoing total hours of generator set operation to aid maintenance scheduling, and confirmation of unattended emergency or periodic exercise of generator set.



*As Required Per Application
**Not Applicable for 120-volt models

FIGURE 2-3. CONTROL ASSEMBLY

ES-1602-1

- **Controller PC Board Assembly (A1)** - this control board contains the necessary monitoring and time delay relays for automatic operation of the transfer switch (Figure 2-4). The components vary by options ordered. Refer to Model Number System and the following descriptions to identify the control relays specific to your application.

Start Relay (K3): This relay is for automatic start-up of the generator set. This relay can be either a no delay type, or, an adjustable (0.1 to 10 second) delay before initiating a start command to the generator set.

Retransfer Relay (K4): this relay provides an adjustable (2 to 30 minute) time delay retransfer of load from emergency to normal power source.

Stop Relay (K5): this relay is for controlling a time delayed stop of the generator set to allow for proper no-load cool-down running of the engine before stopping.

Voltage Sensor Relay (K6): this relay is for monitoring line voltage. There are three types; a non-adjustable phase sensor, or, single-phase or three-phase types with an adjustable voltage pickup range.

If line voltage falls below pickup voltage, relay K6 de-energizes and opens the Time Delay Starting relay to signal generator set starting and transfer. When line voltage returns to the preset pickup voltage, the relay closes and initiates the return-to-commercial-power. Refer to Section 3, Adjustments for adjustable voltage sensor pickup settings and dropout values.

Instant Transfer Relay (K7): this relay provides immediate retransfer of the load to line when normal power is restored.

Transfer Relay (K8): there are two types; non-adjustable, and adjustable time delay (0.3 to 30 seconds). This relay will actuate when generator voltage and frequency reach the settings of the control. Upon actuation (after delay if equipped), the transfer switch transfers the load to the Emergency power source. The time delay type relay (factory set at two seconds) allows the generator set to stabilize before load is applied.

Voltage Sensor Relay (K9): this relay is for monitoring the generator set voltage. Pickup voltage is adjustable. If Emergency voltage falls below preset pickup voltage, relay K9 will become de-energized and close a set of N/C contacts in the generator set start circuit. The generator set will either regain proper speed and output voltage to energize K9 relay or, an overcrank shutdown will occur. Refer to Section 3, Adjustments for voltage sensor pickup settings and dropout values.

Stopping Bypass Switch (A1S1): this switch allows for bypassing the generator set stopping time delay. If the control is equipped with Time Delay Stopping Relay (K5), this switch must be in the OFF position. Otherwise, this switch is in the ON position, and function is bypassed.

Retransfer Bypass Switch (A1S2): this switch allows for bypassing the time delay retransfer relay. If the control is equipped with a Time Delay Retransfer Relay (K4), this switch must be in the OFF position. Otherwise, this switch is in the ON position, and function is bypassed.

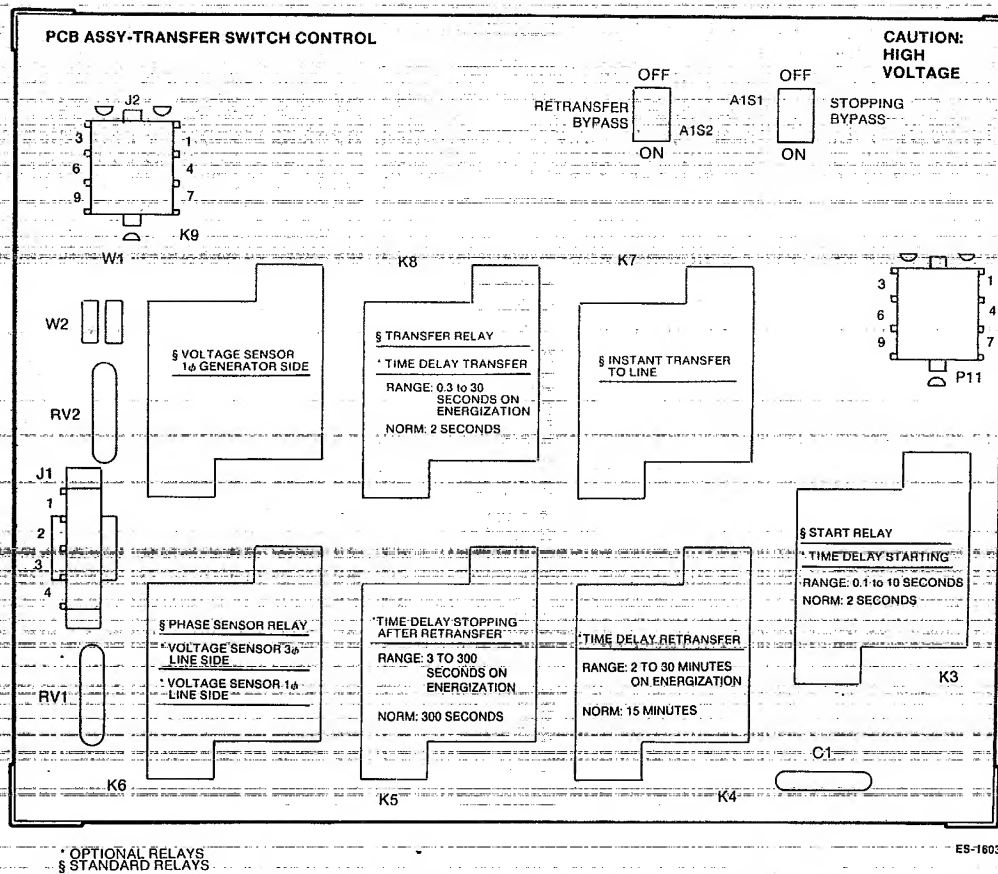


FIGURE 2-4. CONTROLLER PCB ASSEMBLY

NORMAL OPERATION

During normal operation, the commercial power line is connected to the Load terminals by the transfer switch contacts K1. The following briefly describes the required interaction of control components to close the K1 contacts. Refer to Figure 2-5 when reviewing this information to gain an understanding of control component interaction. Then refer to wiring diagram specific to your transfer switch to identify where your transfer switch may differ.

When commercial power is first applied, line voltage is transformed to 120 volts AC and supplied to voltage sensor relay K6. Energizing the coil of K6 will close its normally open contacts to complete the circuit to relay coils K3, K4, K5, and K7. Relay K7 energizes immediately, and if the commercial (Normal) line contacts are not closed, the K1 closing coil (CC) is energized. With K1 closing coil energized, the normally open contacts of K1 between Line and Load will close.

Once the transfer switch is closed to the normal line side, it is held in that position and the closing coil is de-energized by opening of the K1 cutout switch (CS). The cutout switch is activated by the mechanical interlock. Contact operation differs only in how they are held in position, either electrically or mechanically.

Relay K6 can be either a voltage sensor with an adjustable pickup voltage, or a phase loss sensor, when the voltage feeding the relay coil drops below the relay holding voltage.

During normal operation when K3 relay is energized, it opens its normally closed contacts of the generator start circuit, and prevents automatic starting of the generator set.

Relays K4 and K5 (if equipped) function as described in the Restoration of Commercial Power section.

POWER OUTAGE

When commercial power outage occurs, or voltage drops lower than the setting relay K6, K6 de-energizes and opens the circuit to control relays K3, K4, K5, and K7.

De-energizing relay K3 allows its normally closed contacts to close and complete the circuit for generator set start-up. Relay K3 can be either immediate or time delayed (0.1 to 10 seconds) depending on transfer switch model.

Upon start-up of the generator set, voltage sensor relay K9 will energize and close its normally open contacts to transfer relay K8 (if equipped). Relay K8 will then energize and after its adjustable time delay period (0.3 to 30 seconds) it will close its normally open contacts to K1 trip coil (TC) and K2 closing coil (CC) circuits.

Because transfer switch K1 had previously been energized closed, the normally closed K1 interlock contacts (IC) to K2 closing coil would now be open, and the normally open K1 interlock contacts (IC) to K1 trip coil (TC) would be closed.

Upon closing of K8 time delay closed (TDC) contacts, the K1 trip coil (TC) would then energize to open K1.

By opening transfer switch K1, the normally closed interlock contacts (IC) would then close and complete the circuit to energize K2 closing coil (CC). Energizing K2 closing coil (CC) then closes its normally open contacts to complete the transfer of power, and the generator set is connected to the load.

GENERATOR SET STARTING CIRCUITS

Sending start and stop signals to the generator set is a basic function of the transfer switch. The starting circuit function of the transfer switch must be compatible with that of the generator set control. The transfer switch will be either a two-wire or three-wire starting circuit, described as follows:

Two-Wire Starting

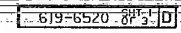
In a two-wire starting circuit, battery voltage (B+) is connected by K3 to the remote (RMT) terminal. When commercial power fails or falls below the holding voltage of voltage sensor relay K6, it de-energizes. This removes power from K3; and after any time delay, K3 closes the contact between B+ and RMT terminals to initiate generator set starting.

For periodic exercise of the generator set, M2 exerciser clock will close its normally open contacts between B+ and RMT terminals to initiate start and run command of the generator set. The generator set will start and run at no load for the time set by the exercise clock M2.

Three-Wire Starting

Normally closed contacts of generator voltage sensor relay K9, and cranking limiter relay K10 are in series in the generator set starting circuit. During a power outage of normal commercial power supply, generator set starting will be initiated by de-energizing relay K3; the normally open contacts for stop command will open, and the normally closed contacts for start command will close.

When the generator voltage sensor relay K9 detects proper generator voltage, the contacts open and remove ground from relay cranking limiter coil K10. If ground is not removed within 60 seconds, K10 will time out and remove the start signal from the generator set by opening its time delay to open (TDO) normally closed contacts. The cranking limiter (K10) is used only with three-wire starting systems.



2-8

The preheat relay option (K11) also has normally open contacts in the generator set starting circuit (3-wire only). This adjustable relay (0.6 to 60 seconds) will time delay generator set starting for the desired time to allow for diesel engine glow plug warm-up before closing its normally open contacts of the starting circuit.

RESTORATION OF COMMERCIAL POWER

When the commercial (Normal) line voltage returns, voltage sensor relay K6 will detect proper line voltage, energize, and close its normally open contacts to complete a circuit to relays K3, K4, K5, and K7.

Energizing retransfer time delay relay K4 (if equipped) will delay closing its normally open, time delay close (TDC) contacts for the desired amount of time (2 to 30 minutes) before allowing instant transfer of line relay K7 to energize. Energizing K7 relay will then close its normally open contacts to complete a circuit to energize K2 trip coil (TC) through the then closed, normally open, K2 interlock contact (IC). When the K2 trip coil (TC) energizes, the opposite K2 interlock contact closes. This completes the circuit to K1 closing coil (CC) through the closed K1 cutout switch (CS). The transfer switch now switches the load back to the commercial (Normal) power source.

The generator set is still running, but will be stopped when time delay stopping relay K5 (if equipped) times out (3 to 300 seconds), and energizes K3 relay. When K3 is energized, it opens its normally closed contacts in the generator set starting circuit.

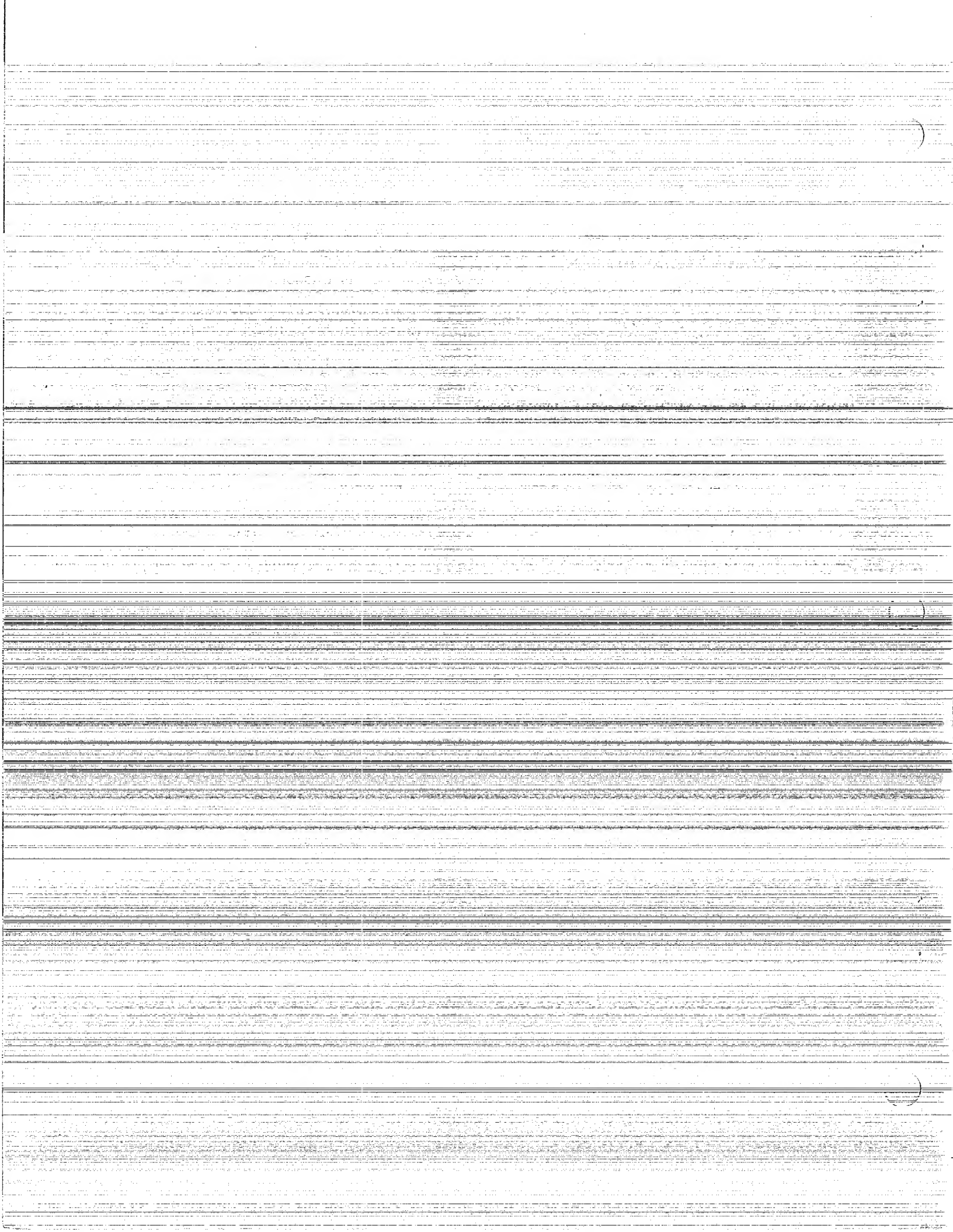
SIMULATION OF POWER OUTAGE

To ensure the equipment is ready to perform, the operator should monthly simulate a power outage. Test Transfer Switch S1 on the inside panel is provided for this function.

In the Normal position, the contacts between switch terminals number 1 and 2 are normally closed, and in series between voltage sensor relay K6 and relays K3, K4, K5, and K7 for automatic transfer switch operation.

Placing switch S1 to the Test position will open the circuit to relays K3, K4, K5, and K7 to initiate a start signal by de-energizing K3 relay. The generator set will start and assume load as long as the switch is in this position.

Moving the switch to Normal causes load transfer to the commercial (Normal) power source after K4 relay retransfer time delay expires. Or, momentarily depressing the S1 switch to Retransfer position will bypass the retransfer time delay relay K4, to energize instant transfer to line relay K7.



Section 3. Adjustments

GENERAL

This section provides information for making adjustments to the time delays, exerciser clock and battery charger. Some adjustments require that AC power be applied to the transfer switch. Use extreme caution to avoid contact of exposed terminals within the cabinet since they present a shock hazard.

⚠ WARNING *High voltages within cabinet and rear side of cabinet door present a shock hazard which can cause severe personal injury or death. Use care when opening cabinet door, and read all safety precautions in front of manual.*

CONTROL RELAYS

The relay function and location on the control printed circuit board is shown in Figure 3-1. Relays K4 and K5 are optional. The time delay functions of relays K3 and K8, and the pickup adjustment of K6 are other options.

The range and normal setting are listed for the adjustable relays. When adjustment is necessary, refer to the following procedures.

Start Relay (K3)

Start relay K3 is equipped with a 0 to 10 scale. Rotate knob to desired time delay start of generator set (0.1 to 10 seconds).

Retransfer Relay (K4)

Retransfer relay is equipped with a 2 to 30 minute scale. Rotate the knob to the desired time delay retransfer from Emergency to Normal commercial power (2 to 30 minutes).

Generator Set Stop Relay (K5)

This relay is equipped with a 0 to 100 percent scale. The maximum time delay of this relay is 300 seconds (5 minutes) when adjustment knob is set at 100 percent position. The recommended generator stop time delay is 3 to 5 minutes (180 to 300 seconds); thus, the adjustment knob should be set within the 60 to 100 percent range.

Time Delay Transfer Relay (K8)

This relay is adjustable for 0.3 to 30 second time delay before transfer of load to emergency power to allow generator set voltage and frequency to stabilize. Adjust the knob to the desired time delay setting.

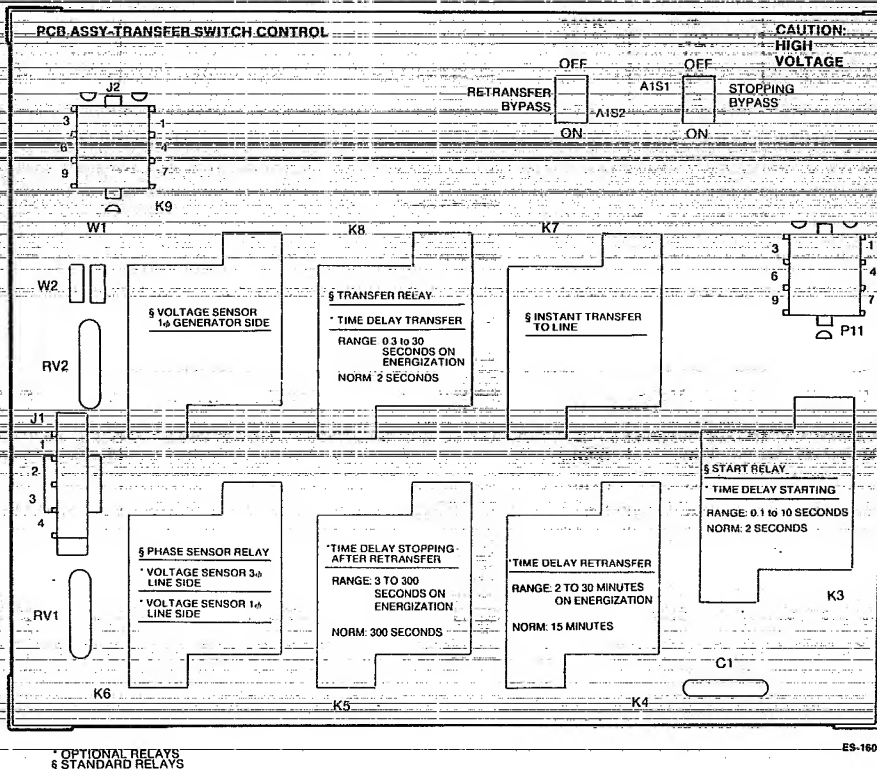


FIGURE 3-1. CONTROLLER PCB ASSEMBLY

Voltage Sensor Relays (K6 and K9)

These relays have an adjustable range of voltage pickup setting. Even though the relays have a typical 1 to 10 dial indicator scale, the relay characteristics may differ slightly due to transfer switch modifications.

Two tables are shown to cover the variances in relay characteristics. Relays having a white number "8" stamped on top are adjustable per Table 3-1. Relays without the white number stamp are adjustable per Table 3-2.

To determine desired setting of the voltage sensor, proceed as follows:

1. Identify relay whether it is stamped with a white "8" or not.
2. Refer to Table 3-1 or 3-2.
3. Determine desired approximate voltage pickup setting using percentage/dial indicator settings indicated.

EXAMPLE: Per Table 3-2, if the nominal transfer switch voltage rating is 208 volts, then a voltage sensor set at a dial setting of 5 would pick-up at approximately 185 volts ($208 \times 89\% = 185$).

4. Rotate relay dial indicator knob to proper setting.

⚠ CAUTION

Do not set voltage sensor above rating of transfer switch or sensor will not operate. Haphazard adjustment can result in abnormal operation of the transfer switch.

**TABLE 3-1. VOLTAGE SENSOR PICKUP SETTINGS
(Relays Stamped with White "8")**

Dial Setting	Approx. Pickup Percent of Nominal AC Voltage
1	78%
2	81%
3	85%
4	89%
5	94%
6	98%
*7	
*8	
*9	
*10	

Note: Dropout Value of Relay is 93-97% of Pickup Voltage

*Do Not Use These Settings

**TABLE 3-2. VOLTAGE SENSOR PICKUP SETTINGS
(Relays Without Number Stamp)**

Dial Setting	Approx. Pickup Percent of Nominal AC Voltage
1	82%
2	83%
3	85%
4	87%
5	89%
6	91%
7	93%
8	95%
9	97%
10	98%

Note: Dropout Values of Relays Are:
 • 3Ø — 93%-97% of Pickup Voltage
 • 1Ø — 80%-85% of Pickup Voltage

EXERCISER CLOCK

The exerciser clock (M2) initiates generator set starting and exercising without load at preset intervals. Later models of the LTI transfer switch have an electronic clock; earlier models have an electromechanical clock. Refer to the appropriate clock section for setting information, and to the generator set Operator's Manual for the recommended exercise schedule before programming the clock.

Place Selector Switch S2 in the Stop position. This will prevent inadvertent starting of the generator set while setting the clock.

Electronic Exerciser Clock

This clock initiates generator set start/run cycles at programmable intervals and for programmable durations. It is a 7-day, 24-hour clock (military time) that can store and execute up to ten start/stop programs (exercise cycles).

Programming requires setting the time of day and entering the exercise start and stop times. Refer to the circled location numbers in Figure 3-2 referenced in the following instructions.

To Set the Time of Day:

1. If you are performing installation and set up, press the **R** button (9) with the tip of a ball-point pen to reset all memory. Do not press the **R** button if you are only changing the time of day.
2. Press the clock button (1).
3. Press the **h** button (3) to set the hour of the day. The clock uses 24-hour (military) time.
4. Press the **m** button (4) to set the minutes of the hour.
5. Press the **1-7** button (5) to advance the indicator bar over the desired day number. (Use the 1 to represent Sunday.)
6. Press the **Pr** button (8) to enter the time.

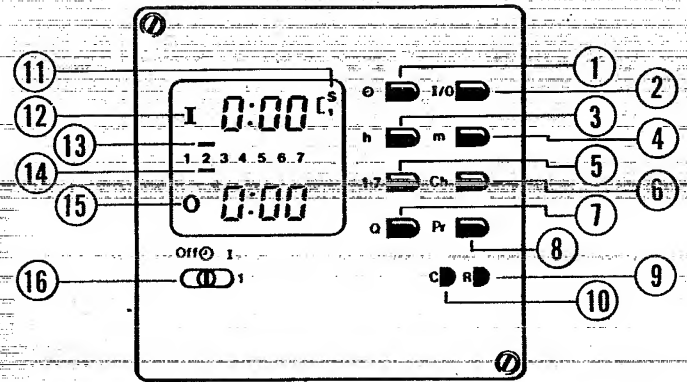


FIGURE 3-2. ELECTRONIC EXERCISER CLOCK

To Set the Exercise Start Time:

1. Slide the output selector switch (16) to the center position. The output selector switch has three positions. The **Off** position overrides the program and prevents the generator set from exercising. The **I** position overrides the program and causes the generator set to start. The center position selects program control.
2. Press the **I/O** button (2). An "I" (12) appears in the upper display window. The "I" is a symbol for start time.
3. Press the **h** button (3) to set the start hour.
4. Press the **m** button (4) to set the start minute.
5. Press the **1-7** button (5) to advance the indicator bar (13) from 1 to 7 and back to 1. For each day to be selected for exercise, press the **Q** button (7) when the indicator is over the desired day number. (1 represents Sunday.)

To Set the Exercise Stop Time

1. Press the **I/O** button (2). An "O" (15) appears in the lower left display window. The "O" is a symbol for stop time.
2. Press the **h** button (3) to set the stop hour.
3. Press the **m** button (4) to set the stop minute.
4. Press the **1-7** button (5) to advance the indicator bar (14) from 1 to 7 and back to 1. For each start time (selected in step 5 above), there must be a corresponding stop time. A program can start on day 2, pass through midnight, and stop on day 3 (for example); but there must be a stop time for every start time. Press **Q** button (7) when the indication is under the desired day number.
5. To enter the complete start/stop program, press the **Pr** button (8). If all program requirements have been satisfied, the display returns to the time-of-day. If the program requirements are not met, the display of the section that needs correction flashes on and off.

To enter more programs, repeat the two 5-step procedures. A maximum of ten programs can be entered. (The same ten programs can be repeated each day.)

The word "Full" appears in the display when the memory is full.

If the **I/O** button (2) is pressed and no program is to be entered, press the **Ch** button (6) and then the **Pr** button (8) to get out of the program mode.

To Check the Programs

1. Press the **Ch** button (6). An "I" (12) and an "O" (15) are displayed.
2. Press the **Ch** button (6) again. The start and stop information for the first program is displayed.
3. Continued pressing of the **Ch** button (6) causes the display to sequence through all of the programs in memory. If ten programs have been entered, the word "Full" appears after the tenth program display.
4. Press the **Pr** button (8) to return to the time-of-day display.

To Change (Edit) a Program

1. Press the **Ch** button (6) until the program you want to change appears in the display window.
2. Press the **I/O** button (2) to select start or stop time.
3. Press the **h** (3), **m** (4), or **1-7** (5) and **Q** (7) buttons to change the hour, minute, or day.
4. Press the **Pr** button (8) to enter the edited program and return to the time-of-day display.

To Erase (Clear) a Program

1. Press the **Ch** button (6) until the program to be erased is displayed.
2. Press the **C** button (10) to clear the program.
3. Press the **Pr** button (8) to return to the time-of-day display.

When adjustments to the optional control modules are completed, return Selector Switch S2 to the Auto position. Close the cabinet door and turn to the Checkout section.

Electromagnetic Exerciser Clock

This clock initiates generator set starting and exercising at preset intervals. The large dial divides the 24-hour day into 15-minute intervals. A smaller spoked dial divides the week into one-day segments. See Figure 3-3.

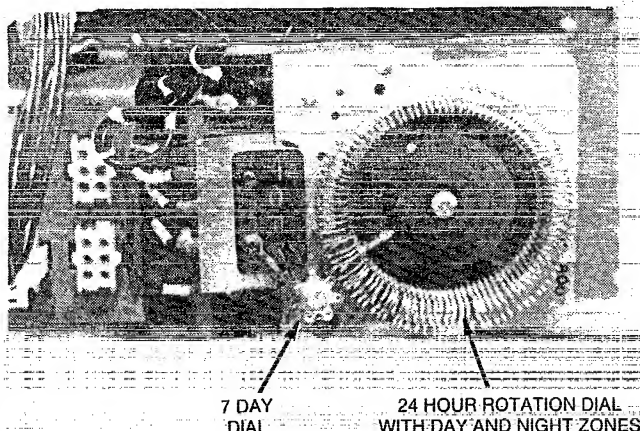


FIGURE 3-3. ELECTROMAGNETIC EXERCISER CLOCK

To Change Exerciser Program:

1. On the 24-hour large dial, tilt tabs inward opposite the time of day generator set is to run. Each tab is a 15-minute increment, so for 30-minutes run time, tilt two adjacent tabs. See Figure 3-3.

Onan recommends settings which will operate the generator set for at least 30 minutes each week. Exercising for one long period is better than several short periods.

2. On the small 7-spoke day wheel, remove a screw from spoke corresponding to the day of exercise.

Set Exerciser for Correct Day and Hour as Follows:

1. Rotate the large dial until the correct time of day aligns with the pointer.
2. Turn the small spoked wheel until the correct day aligns with the pointer.

Return the Selector Switch S2 to the Auto position.

BATTERY CHARGER

The battery charger (A2) is a float type, with a 2-ampere charging rate capacity for either 12- or 24-volt batteries. Make sure the 12V/24V switch (Figure 3-4) is properly set for your application as noted in the Caution below.

⚠ WARNING If the 12V/24V switch is left in the 24-volt position on a 12-volt system, the battery will be overcharged. Continued overcharging of a battery creates risks of permanent battery damage and severe personal injury if the explosive battery gasses ignite.

The charge level of the battery floats at a constant voltage. As the battery approaches the preset full charge voltage, the charging current automatically tapers to zero. This keeps the battery fully charged with no gassing and no overcharging.

The float voltage is set at the factory and should not require adjustment. However, if the battery shows signs of being overcharged or undercharged, the float voltage can be adjusted. A high specific gravity, bubbling of electrolyte, and loss of water indicate a high float voltage. A low specific gravity indicates a low float voltage.

⚠ WARNING Ignition of explosive battery gasses can cause severe personal injury. Do not smoke while servicing batteries.

To change the float voltage, a fully charged battery, a hydrometer, a small screwdriver with insulated shank, and accurate voltmeter (0.5 percent accuracy) are needed. Use the following procedures to adjust.

Turn the operation selector switch for the generator set (S2) to STOP; and disconnect the set starting battery. The selector switch is located on the generator set control panel on two-wire start systems and on the transfer switch control panel (S2) on three-wire start systems.

1. Connect the fully charged battery to the generator set and verify charge condition with the hydrometer. A fully charged lead-acid battery will have a specific gravity of 1.260 at 77°F (25°C).
2. Connect the voltmeter directly to the battery terminals and measure the voltage.
3. Compare the voltage reading with the value shown in Table 3-1. If the voltage is above or below the recommended float voltage, open the cabinet door and adjust as specified in step 4. If the voltage is correct, proceed to step 5.

TABLE 3-1

Lead-Acid Batteries	
Battery Voltage	Float Voltage
12	13.3
24	26.6
Nickel-Cadmium Batteries	
Float Voltage Charge Per Cell	
1.38 to 1.45	

Example: Float charge for 10 cell battery should be 13.8 to 14.5 volts

4. Use a small screwdriver with insulated shank to turn the adjustment potentiometer clockwise to increase float voltage and counterclockwise to decrease float voltage. Adjust in small steps and wait five minutes for the voltage to stabilize before making additional adjustments.

⚠ WARNING *High voltages within the cabinet can cause severe personal injury or death. Use care when making adjustments to avoid touching high voltage components.*

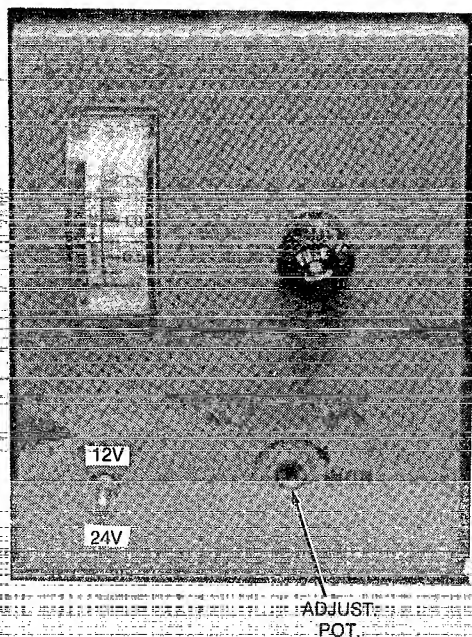


FIGURE 3-4. BATTERY CHARGER ADJUSTMENT

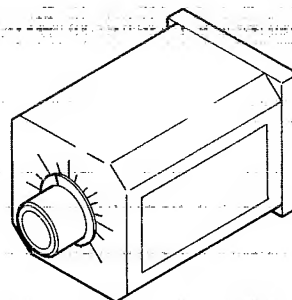
5. Disconnect the voltmeter from the battery terminals and disconnect the test battery from the generator set.
6. Reconnect the generator set starting battery (-) lead last.
7. When adjustments are complete, place the operation selector switch (S2) in automatic position, and close the transfer switch cabinet door.

PREHEAT TIME DELAY

This delay (K11) is used for diesel engine generator sets only. It provides for glow plug warm-up before engine cranking. See Figure 3-5.

Determine the preheat time delay required (refer to the generator set operator's manual). The preheat time delay has a range of 0.6 to 60 seconds.

The relay adjustment settings are marked in increments that range from 0 to 100 percent. A 100 percent setting equals a 60 second delay, a 50 percent setting equals a 30 second delay, etc. Turn the knob clockwise to increase the delay and counterclockwise to decrease the delay.



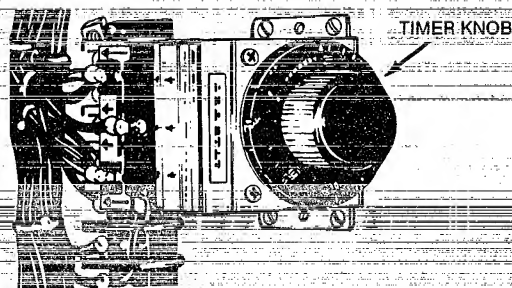
ES-1601

FIGURE 3-5. PREHEAT TIME DELAY

PROGRAMMED TRANSITION

Three programmed transition time delays (K20) are available with LT II transfer switches (mechanically held both sides only). The delay periods are adjustable from 0.5 to 5 seconds, 1.5 to 15 seconds, or 5 to 50 seconds depending on the option selected.

Turn the timer knob (Figure 3-6) clockwise to increase the delay and counterclockwise to decrease the time delay. Increments are marked on the knob. Appropriate time setting is determined by site requirements.



SC 1394

FIGURE 3-6. PROGRAMMED TRANSITION TIME DELAY

Section 4. Transfer Switch Assembly

GENERAL

This section covers the procedures for removal and replacement of serviceable components of the transfer switch assembly. Even though the 30 to 200 ampere transfer switches differ in size, the following procedures are essentially the same.

The three-pole contact assemblies make and break the current flow to the load. The transfer switch is electrically and mechanically interlocked to prevent simultaneous closing to both power sources.

When closed to either Normal or Emergency power source, the contacts are either mechanically or electrically held depending upon chosen options. Mechanically-held contacts are held closed by a latch that disconnects the closing coil. This eliminates hum during normal operation.

REPLACING AUXILIARY SWITCH

⚠ WARNING *The transfer switch presents a shock hazard that can cause severe personal injury or death. Be sure to disconnect the generator set starting battery and remove the normal AC power before attempting service.*

An optional auxiliary switch may be fitted to the Normal and Emergency side of the transfer switch as shown in Figure 4-1. The auxiliary switch is secured to the transfer switch by a single mounting screw.

If an ohmmeter check indicates a faulty switch, first remove the mounting screw and switch. Then install new switch and transfer leads from old switch to the new one to prevent wiring error. When mounting, be sure bottom of switch is properly engaged in the mounting tab and that the switch actuator is inserted under the carrier actuator. Tighten mounting screw.

Before restoring power to the transfer switch, manually operate the movable contact carrier assembly to assure free movement (push on contact carrier end posts). On mechanical-held switches, slide the latch manual release button in direction of arrow to open contactor.

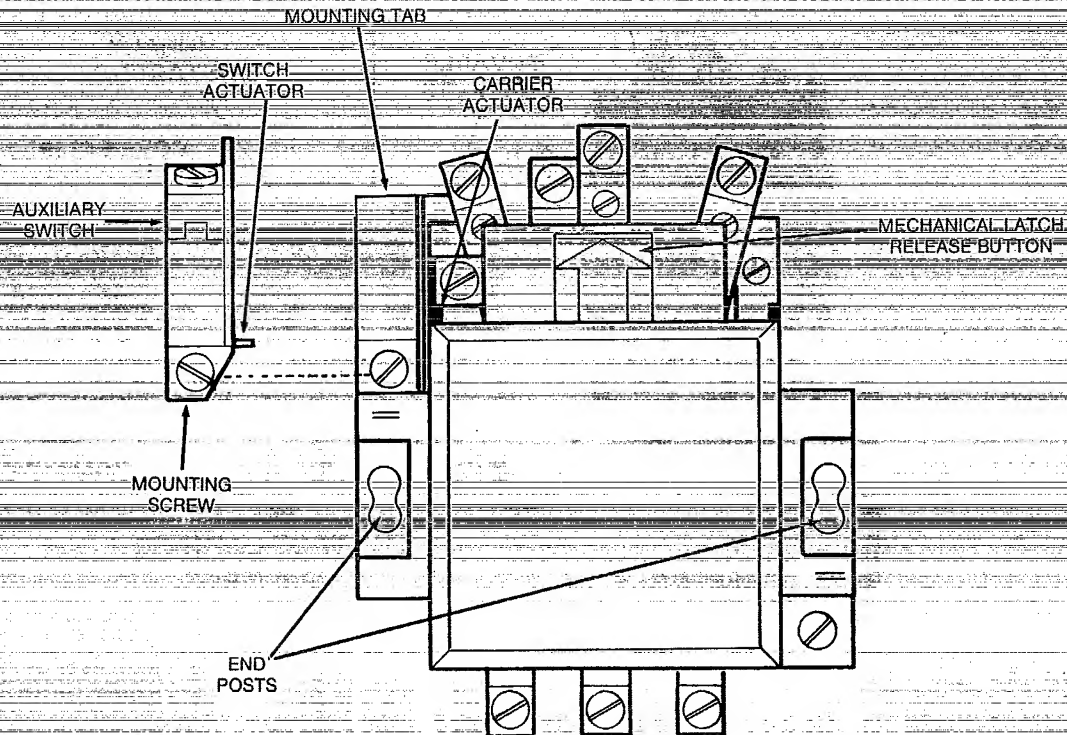


FIGURE 4-1. INSTALLING AUXILIARY SWITCH

REPLACING MAIN CONTACTS

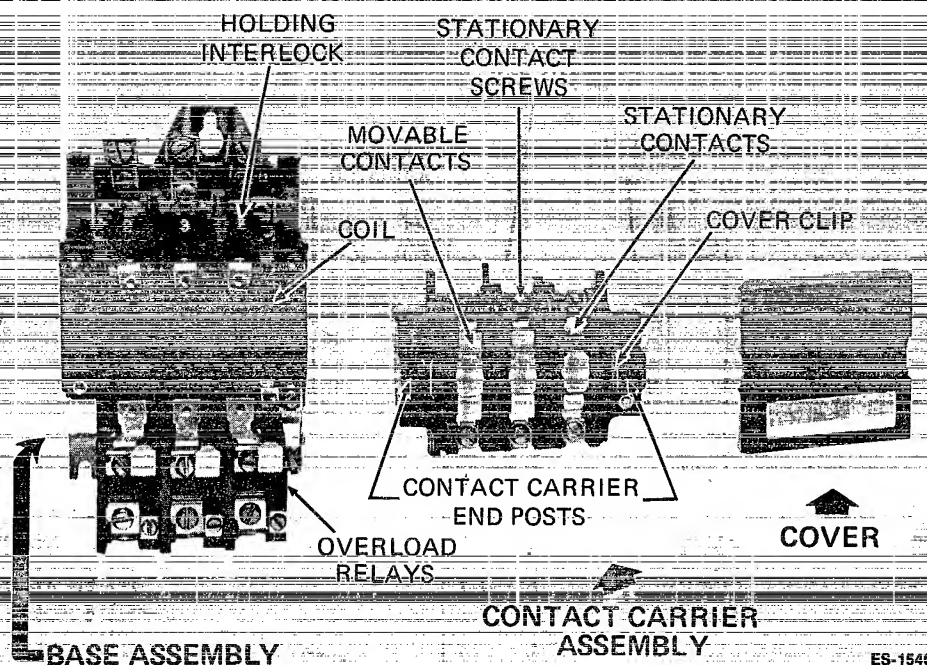
⚠WARNING *The transfer switch presents a shock hazard that can cause severe personal injury or death. Be sure to disconnect the generator set starting battery and remove the normal AC power before attempting service.*

Inspection of the main contacts is done by pushing the cover clips outward and removing the contact cover. See Figure 4-2. All portions of contacts are now visible. It is not necessary to remove contact carrier assembly shown in Figure 4-2 to replace main contacts. If contacts need replacement, use the following procedure.

1. Lift spring-loaded contact retainers upward and pull out movable contacts.
2. Loosen stationary contact screws and lift out contacts.

3. Install new stationary contacts and tighten contact screws.
4. Install new movable contacts under retainers.
5. Install cover and secure with cover clips.
6. Manually operate the movable contact carrier assembly to assure free movement (push on contact carrier end posts). On mechanical held switches, slide the latch manual release button in direction of arrow to open contacts.

⚠CAUTION *The transfer switch cannot function correctly unless properly assembled. Be sure all stationary contact screws are tightened, cover and cover clips are in place before power is restored.*



ES-1540

FIGURE 4-2. TRANSFER SWITCH DISASSEMBLY

REPLACING CLOSING COIL

⚠WARNING *The transfer switch presents a shock hazard that can cause severe personal injury or death. Be sure to disconnect the generator set starting battery and remove the normal AC power before attempting service.*

The closing coil is located under the contact carrier assembly. See Figure 4-2. To gain access to the coil, either for testing or replacement, use the following procedure. Reference the resistance readings in Table 4-1 for testing with an ohmmeter.

1. Remove mechanical latch (if used) by backing out two mounting screws.
2. Push the cover clips outward and remove the contactor cover.
3. Loosen all stationary contact screws. Pull out contact carrier assembly. All contacts and screws will remain captive to the assembly if it is not turned over.
4. Remove coil by grasping the tabs at each end and lifting straight up.
5. Insert coil with the tabs up and coil contacts against wipers.
6. Place carrier assembly in position and tighten stationary contact screws.
7. Install mechanical latch (if used) and top cover. Secure cover with the cover clips.
8. Manually operate the movable contact carrier assembly to assure free movement (push on contact carrier end posts). On mechanically held switches, slide the latch manual release button in direction of arrow to open contactor.

⚠CAUTION *The transfer switch cannot function correctly until properly assembled. Be sure all stationary contact screws are tightened, and cover and cover clips are in place before power is restored.*

**TABLE 4-1. CLOSING COIL RESISTANCE IN OHMS
@ 77°F (25°C) ± 10%**

Voltage/Frequency	Ampere Rating			
	30	60	100	200
120V/60 Hz	36.5	19.5	10	4.23
120V/50 Hz	40	25.8	13	5

REPLACING MECHANICAL LATCH (IF USED)

⚠WARNING *The transfer switch presents a shock hazard that can cause severe personal injury or death. Be sure to disconnect the generator set starting battery and remove the normal AC power before attempting service.*

The mechanical latch and coil assembly is located above the main body of the transfer switch. See Figure 4-3. The latch is most commonly used on the line (Normal) contactor. It allows the line closing coil to be de-energized, reducing hum, vibration, and extended coil life expectancy.

To test coil resistance, disconnect control wire leads and remove mechanical latch from transfer switch by backing out the two mounting screws.

Connect an ohmmeter to the trip coil lead and terminal. The trip coil resistance should be about 39.2 ohms @ 77°F (25°C) ± 10%. Replace with new if resistance reading is other than above.

After assembling the latch to the transfer switch, manually operate the movable contact carrier assembly to assure free movement (push on contact carrier end posts). Slide the latch manual release button in direction of arrow to open contactor.

⚠CAUTION *The transfer switch cannot function correctly unless properly assembled. Be sure all stationary contact screws are tightened, and cover and cover clips are in place before power is restored.*

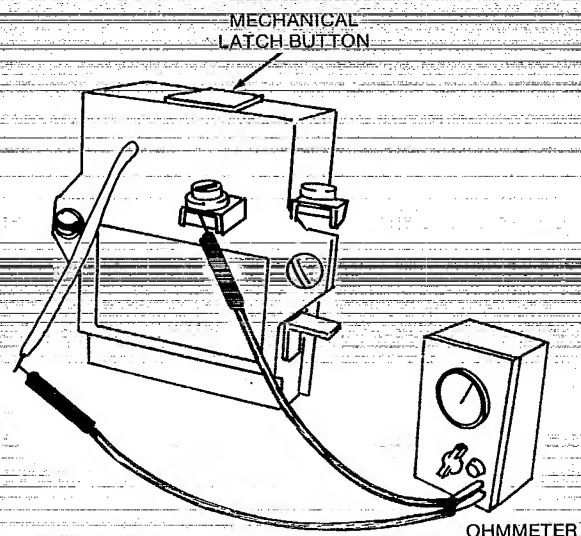
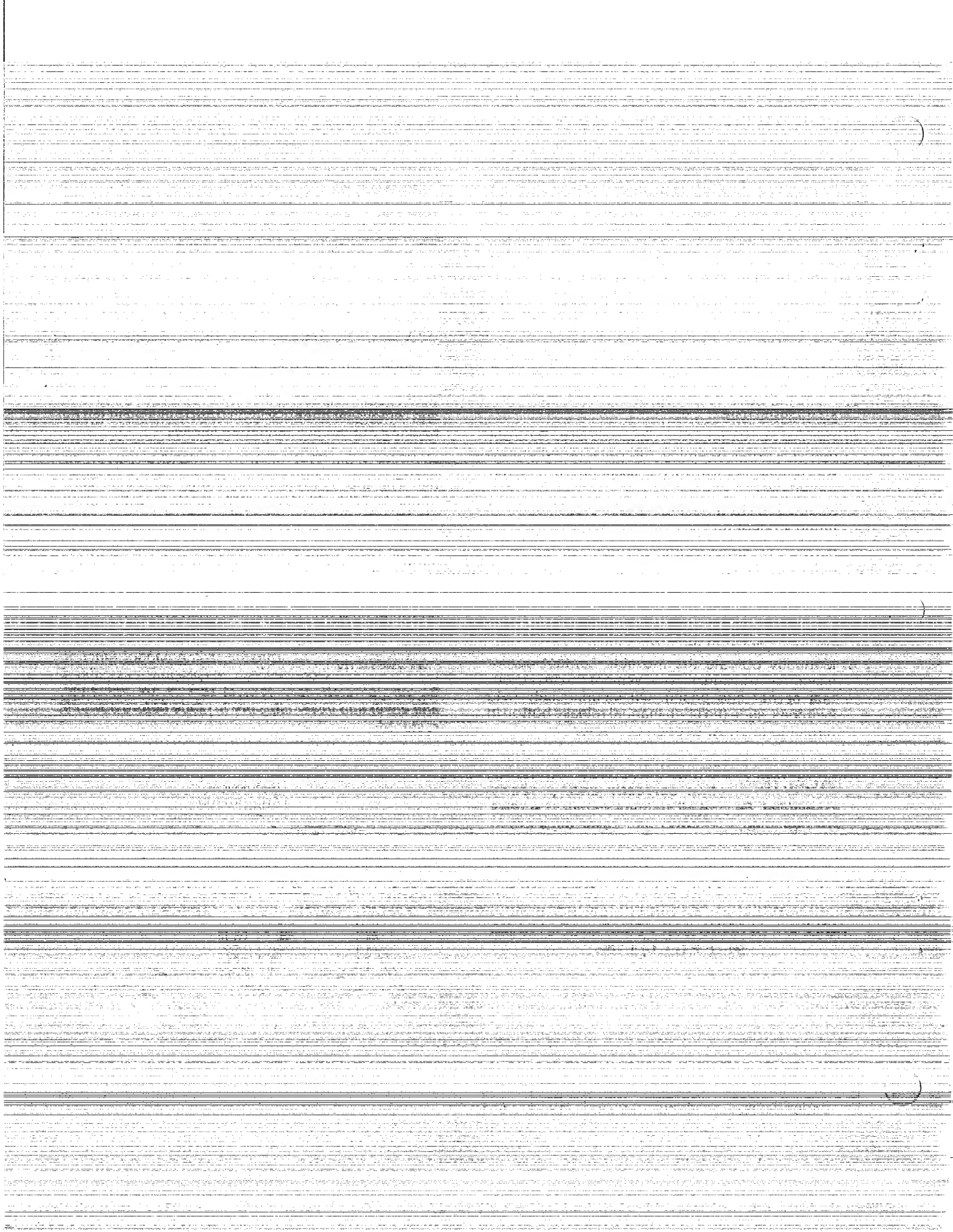


FIGURE 4-3. TESTING MECHANICAL LATCH TRIP COIL



Section 5. Troubleshooting

GENERAL

During periods of normal operation, review the detailed descriptions of component interaction in the Operation Description section. Having a thorough understanding of the normal operation of the transfer switch, to include any options that may apply, will aid in more effective and timely troubleshooting and repair should a fault condition occur. Also refer to Normal Automatic Operation Sequence in this section.

Troubleshooting/servicing of the LT II transfer switch requires service personnel to have a current schematic diagram for the specific unit being serviced. This is necessary due to control group options, voltage codes and adders that may appear in one transfer switch and not another.

The troubleshooting information and procedures that follow will depict a typical 3-wire transfer switch application that includes options. When troubleshooting other units (i.e., 2-wire, or different options) apply similar approach or logic to your circuit analysis and fault finding procedures.

If a problem is evident, check the more logical or more easily accessible components first. For example: generator set does not start on power outage - check manual starting at the engine control first. The problem could simply be a bad battery or battery connection.

⚠ WARNING High voltages within control and rear side of cabinet door present a shock hazard which can cause severe personal injury or death. Use care when opening cabinet door.

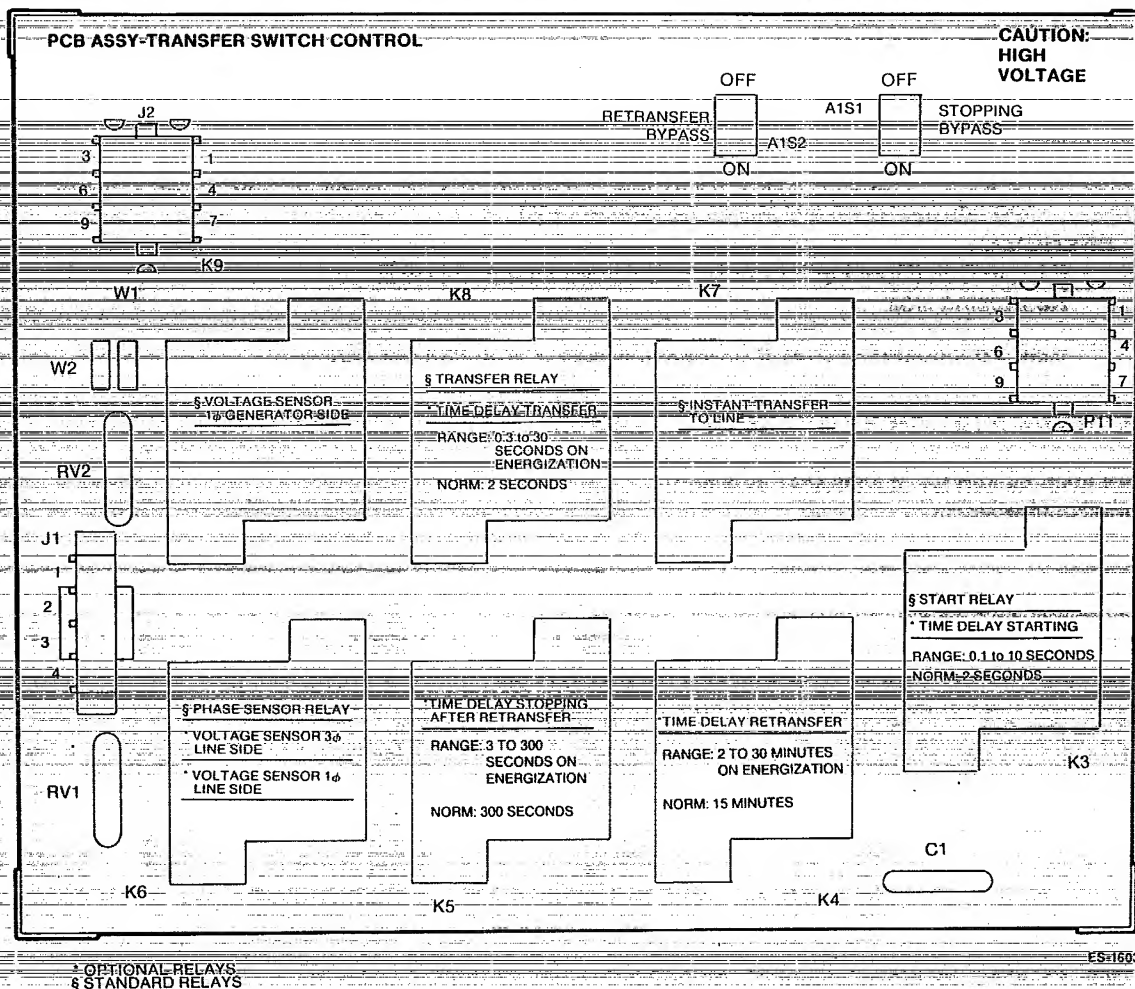


FIGURE 5-1. CONTROLLER PCB ASSEMBLY

NORMAL AUTOMATIC OPERATION SEQUENCE

COMMERCIAL POWER SUPPLIED TO LINE SIDE TRANSFER SWITCH K1.

ENERGIZES

K6 Voltage Sensor Relay

ENERGIZES (with switch S1 at NORMAL position)

K4 Time Delay Transfer Relay (Optional)

K7 Instant Transfer Relay

K3 Generator Set Start Relay

K5 Generator Set Time Delay Stop After Retransfer (Optional)

ENERGIZES

K2 Trip Coil (If applicable)

K1 Closing Coil

With K1 contacts closed, Normal line power is supplied to Load.

COMMERCIAL POWER FAILS

DE-ENERGIZES

K6 Voltage Sensor Relay (Opening circuit to relays K3, K4, K5, and K7).

K3 Generator Set Start Relay

After time delayed closing of K3 contacts, engine start command begins. (Three-wire starting requires switch S2 to be at AUTO position.)

GENERATOR SET STARTS

ENERGIZES (when generator reaches proper voltage)

K9 Voltage Sensor Relay

ENERGIZES

K8 Time Delay Transfer Relay (Allowing generator set to stabilize, and delay transfer should Normal power failure be momentary.)

ENERGIZES

K1 Trip Coil (Opening K1 contacts between Line and Load).

K2 Closing Coil

With K2 contacts closed, Emergency power is supplied to Load.

NORMAL POWER SUPPLY RETURNS

ENERGIZES (with switch S1 at NORMAL position)

K6 Voltage Sensor Relay

ENERGIZES

K4 Time Delay Retransfer Relay (Optional)

Or, bypasses K4 thru switch A1S2 (ON position)

K7 Instant Transfer Relay

To open the circuit to K1 Trip Coil and K2 Closing Coil

To close the circuit to K2 Trip Coil and K1 Closing Coil

K5 Generator Set Time Delay Stop After Retransfer Relay. (Optional)

Providing normal time delayed cool-down stopping of generator set, and also allows for reconnect to Emergency power, should Normal power return be only momentary.

K3 Generator Set Start Relay

Opens contacts in generator set circuit to stop engine.

ENERGIZES

K2 Trip Coil (Opening K2 Transfer Switch)

K1 Closing Coil

With K1 contacts closed, Normal line power supply is returned to Load.

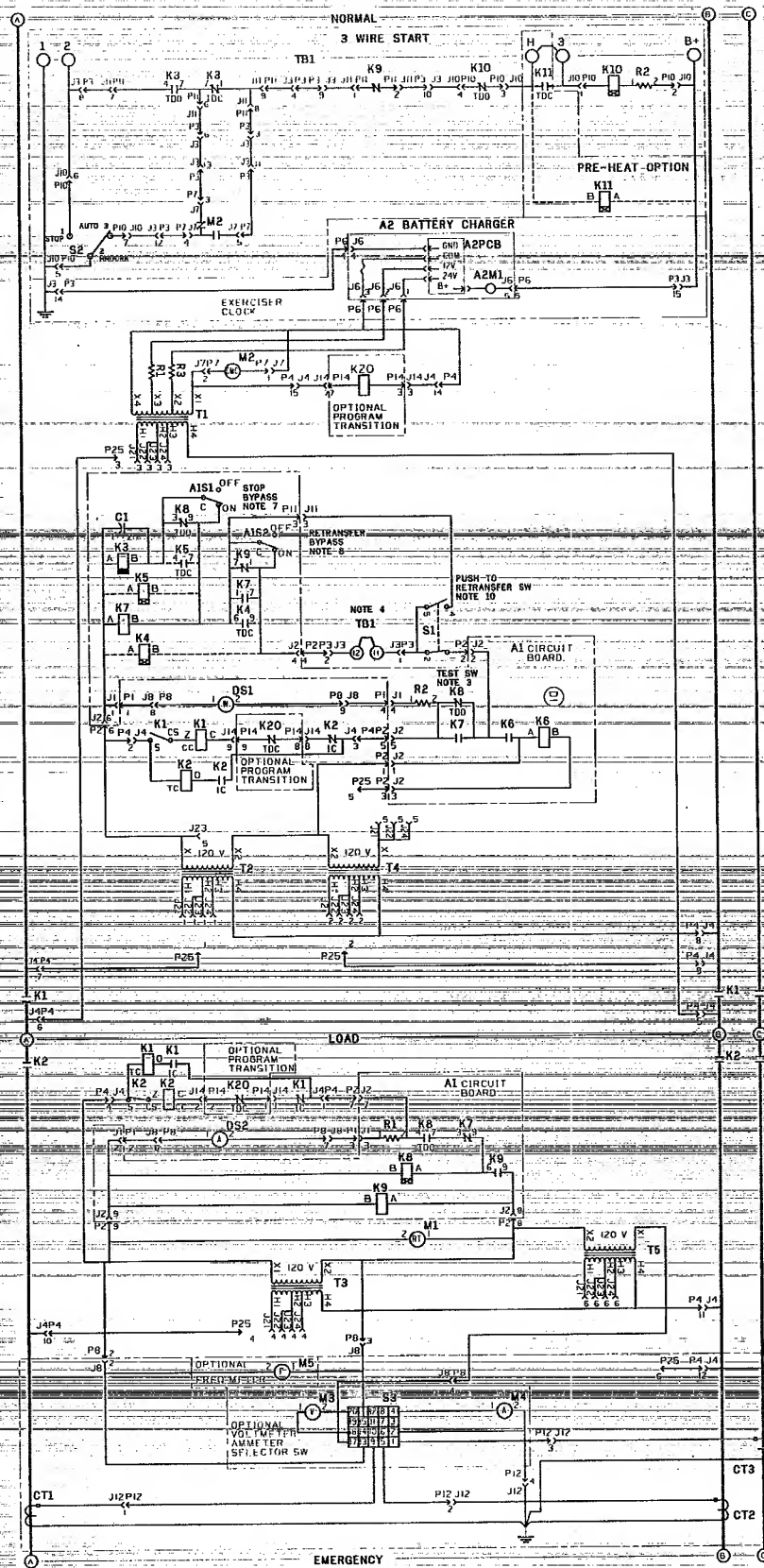


FIGURE 5-2. TYPICAL WIRE DIAGRAM FOR 3-WIRE START SYSTEM
WITH TRANSFER SWITCHES MECHANICALLY HELD BOTH SIDES

TYPICAL PROBLEMS

This section lists some common problems that might occur with an installation and the areas to look for possible malfunction.

Power Outage Occurs, But Generator Set Does Not Start

▲WARNING *High voltages within control and rear side of cabinet door present a shock hazard which can cause severe personal injury or death. Use care when opening cabinet door.*

1. Check position of Selector Switch S2, should be in AUTO position (3-wire start only).
2. Check for overcrank condition by observing Cranking Limiter button K10 (3-wire start only).
3. Onan water-cooled generator sets (2-wire starting only); Selector switch on the generator set control panel must be in the REMOTE position.
4. Check generator set. Start with start-stop controls on generator set. If it does not crank, check starting batteries. If it cranks but does not start, check fuel supply.

▲WARNING *Ignition of explosive battery gases can cause severe personal injury. Do not smoke while servicing.*

▲WARNING *Ignition of fuel can cause severe personal injury or death by fire or explosion. Do not permit any flame, cigarette, pilot light, spark, or other igniter near the fuel system.*

5. Check transfer switch relays K3 and K11 for proper settings, or if defective (if equipped).
 - K3 - Time Delay Start
 - K11 - Preheat Time Delay

When Generator Set is Started Manually, Transfer Switch Transfers Load (Normal Line On)

▲WARNING *High voltages within control and rear side of cabinet door present a shock hazard which can cause severe personal injury or death. Use care when opening cabinet door.*

1. Check K4 Time Delay Retransfer relay; the coil may be defective.

Generator Set Starts But Does Not Assume Load

1. Check output voltage of the emergency power source by observing voltmeter of generator set or optional voltmeter on the transfer switch.
2. If DS2 does not light; check for misadjusted or defective:
 - Voltage Sensor K9
 - Time Delay Transfer Relay K8
 - Instant Transfer to Line Relay K7
3. If DS2 lights, check:
 - K1 Trip Coil
 - K1 Interlock Contacts
 - K2 Closing Coil
 - K2 Cutout Switch
 - Program Transition Module K20

▲WARNING *High voltages within control and rear side of cabinet door present a shock hazard which can cause severe personal injury or death. Use care when opening cabinet door.*

No Transfer of Load From Generator Set to Normal Power

1. Test Transfer Switch S1 in TEST position. Push to RETRANSFER position; switch toggle should spring return to NORMAL position.
2. The K4 Retransfer Time Delay (if equipped) might not have expired. Check setting of K4 relay, and compare it to time elapsed since return of normal power. If K4 relay appears faulty, depress the Test Transfer Switch to RETRANSFER position. Readjust, or replace relay K4. To temporarily bypass this relay until its checkout or replacement, place switch A1S2 to ON position.
3. Stop the generator set with its start-stop switch. When the generator set stops, the transfer switch should transfer load to the normal power source if voltage is normal.
4. If DS1 does not light, check for misadjusted or defective:
 - Voltage Sensor Relay K6
 - Time Delay Retransfer Relay K4
 - Instant Transfer to Line Relay K7
5. If DS1 lights, check:
 - K2 Trip Coil
 - K1 Closing Coil
 - K1 Cutout Switch
 - Program Transition Module K20

▲WARNING *High voltages within control and rear side of cabinet door present a shock hazard which can cause severe personal injury or death.*

Generator Set Continues to Run After Retransfer of Load to Normal Power

1. Check if Exerciser Clock M2 is at exercise cycle position.
2. Check Time Delay Stopping Relay K5 (if equipped) and Time Delay Starting Relay K3. Check setting of K5 relay, and compare to time elapsed since retransfer of load to normal power. Readjust, or replace relay. To temporarily bypass this relay until its checkout or replacement, place switch A1S1 to ON position.

Generator Set Starts During Normal Power Service

1. Two-wire starting; Selector switch on the set control panel must be in REMOTE position.
2. Check Test Transfer Switch S1 inside transfer switch cabinet to make sure it is set at NORMAL position.
3. Check Exerciser Clock M2 to see if it is scheduled for exercise cycle.
4. Momentary voltage dips might cause voltage sensor K6 to initiate generator set starting. Voltage sensing settings on K6 might have to be changed, refer to Section 3, Adjustments.

▲WARNING *High voltages within control and rear side of cabinet door present a shock hazard which can cause severe personal injury or death. Use care when opening cabinet door.*

Generator Set Does Not Exercise

1. Check position of Selector Switch S2; should be in Auto position (3-wire start only).
2. Two-wire starting only; Selector switch on the set control panel must be in REMOTE position.
3. Check switch operation on Exerciser M2. Check to see if it is set correctly and is running.
4. Check generator set. Start with start-stop control of generator set. If it does not crank, check the starting batteries cable connections. Is battery fully charged? (Refer to Battery Charger Fails to Charge).

If the engine cranks but does not start;

- Check fuel supply.
- Check for overcrank condition by observing Cranking Limiter button K10 (3-wire start only).
- Check for misadjusted Preheat relay K11 and related glow plug circuitry (3-wire start diesel engine generator sets only).

▲WARNING *High voltages within control and rear side of cabinet door present a shock hazard which can cause severe personal injury or death. Use care when opening cabinet door.*

Battery Charger Fails to Charge

⚠WARNING *High voltages within cabinet and rear side of cabinet door present a shock hazard which can cause severe personal injury or death. Use care when opening cabinet door.*

1. Check status of 5 ampere fuse F1. Replace if required. Check battery charger DC Ammeter A2M1 to see if charge rate registers.
2. Check tightness of plug/jack harness connections; P6/J6, P4/J4, and P3/J3. Check battery charger DC ammeter A2M1 to see if charge rate registers.
3. Check condition of generator set starting battery connections.

⚠WARNING *Ignition of explosive battery gases can cause severe personal injury. Do not smoke while servicing.*

If necessary, remove cables and clean battery posts and cable connectors. Check battery electrolyte level, replenish if necessary. Refer also to Battery Charger, in Adjustments section.

4. Disconnect P6/J6 harness connection to battery charger. Perform the following voltage checks at plug P6 positions as follows:

A. Power supply from transformer T1;

- P6-2, -3 — approx. 20 VAC (12 volt starting system)
- P6-1, -3 — approx. 40 VAC (24 volt starting system)

If proper voltage is read, proceed to step B.

If proper voltage does not register on voltmeter, check terminal connections of resistors R1 (12V system) or R3 (24V system). If connections are secure, check for proper voltage to and through resistor R1 or R3 terminals.

If proper voltage is read at one terminal and not the other, replace resistor.

If voltage is not read at either terminal of R1 or R3, check terminal connections at transformer T1, and perform the following voltage checks;

- X3-X4 — approx. 20 VAC (12 volt starting system)
- X2-X4 — approx. 40 VAC (24 volt starting system)

Check input connections and voltage to transformer T1. Remedy as required by replacing transformer, or during next available time that transfer switch can be isolated from Normal AC power, check wiring and related connections of transformer T1, to phase tapped power supply.

- B. Perform voltage check of plug P6-5 (B+), -4 (GND). This voltage reading should be same as starting battery voltage (12- or 24-volts).**

If so, continue to step C.

If not, check plug to jack connection P3/J3 and TB1 (3-wire) or TB2 (2-wire) B+ terminal connection and related wiring to generator set.

- C. Reconnect plug/jack connection P6/J6. Perform voltage check of both terminals of Ammeter A2M1;**

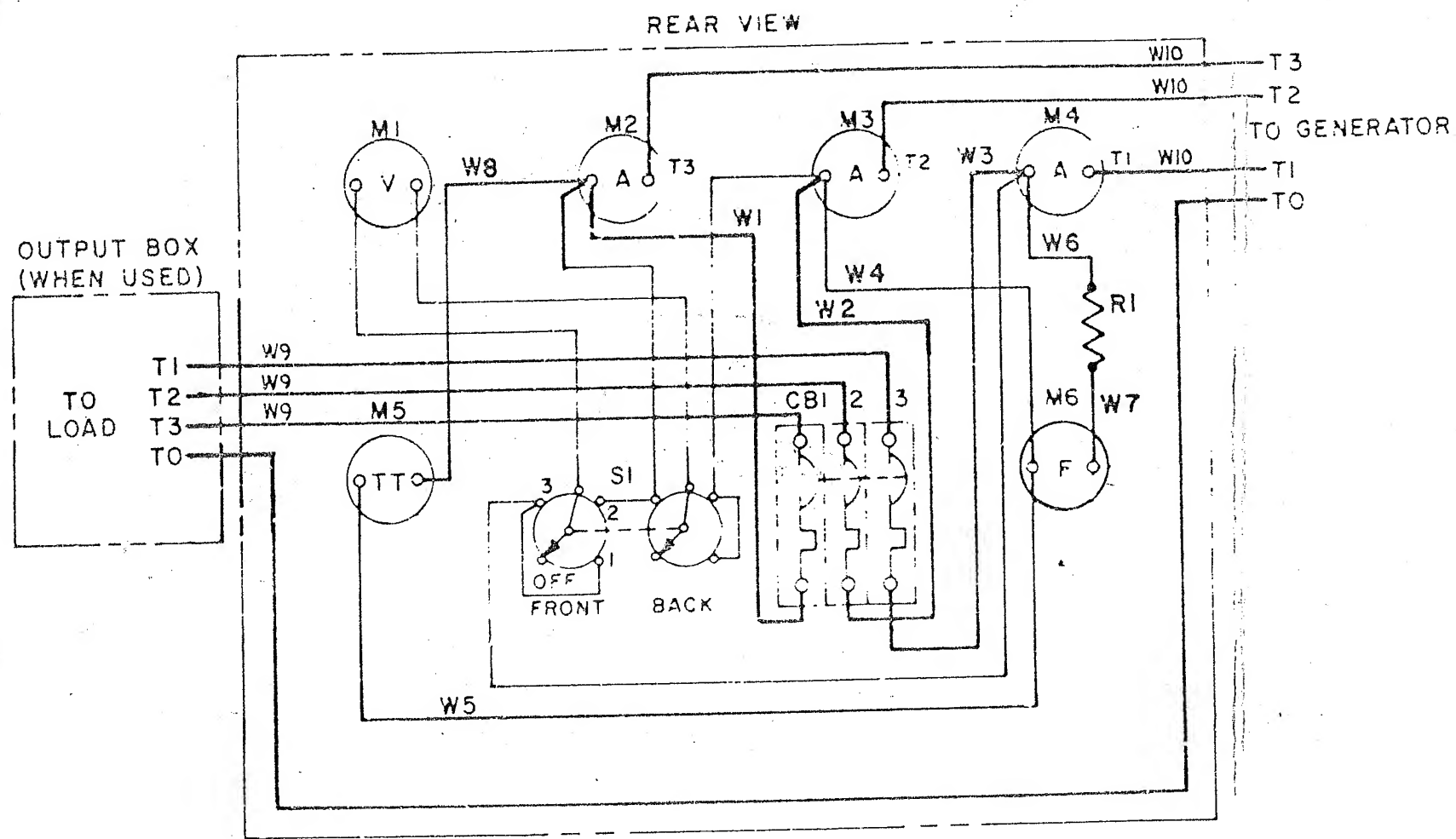
- Lower terminal (-) 12- or 24-volts DC
- Upper terminal (+) 12- or 24-volts DC

If voltage differs, replace Ammeter A2M1.

If voltage is same, continue voltage check of (+) terminal of Ammeter A2M1 and adjust charge rate adjustment potentiometer to increase charge rate. If no increase registers on voltmeter, replace battery charger PCB.

612-1851

DWG
SIZE
B



PARTS LIST					
REF DES	PART NO.	QTY	DESCRIPTION		
CBI 2 3	SEE TAB	P 1	CIRCUIT BREAKER		
M1	302-0422	P 1	VOLTMETER AC 0-600V		
M2 3 4	SEE TAB	P 3	AMMETER AC		
M5	302-0467	P 1	METER-RUNNING TIME		
M6	302-0213	B 1	METER-FREQUENCY		
R1	304-0305	A 1	RESISTOR 45,000-OHM, 10 W.		
S1	308-0407	A 1	SWITCH & LEADS VM SEC		
	303-0076	- 1	KNOB		
	98-1910	A 1	SILKSCREEN		
M1	SEE TAB	A 1	LEAD ASSY		
M2	SEE TAB	A 1	LEAD ASSY		
M3	SEE TAB	A 1	LEAD ASSY		
M4	336-2851	A 1	LEAD ASSY		
M5	336-1468	A 1	LEAD ASSY		
M6	226-1511	A 1	LEAD ASSY		
M7	226-1511	A 1	LEAD ASSY		
M8	336-0433	A 1	LEAD ASSY		
	301-2308	C 1	PANEL-INSTRUMENT		
M9	SEE TAB	A 3	LEAD ASSY		
M10	SEE TAB	A 3	LEAD ASSY		

KW	60Hz	50Hz	AMMETER	CIRCUIT BREAKER	LEAD ASSY W1	LEAD ASSY W2	LEAD ASSY W3	LEAD ASSY W9	LEAD ASSY W10
6	-01		302-0460 0-20	320-0484 12A	226-1507	226-1506	226-1505	226-0740	226-1005
7.5	-02		302-0460 0-20	320-0485 15A	226-1507	226-1506	226-1505	226-0740	226-1005
10	-03		302-0418 0-30	320-0486 20A	226-1513	226-1517	226-1487	226-0740	226-1005
12,12.5	-04		302-0418 0-30	320-0486 20A	226-1518	226-1517	226-1487	226-0740	226-1005
15	-05		302-0418 0-30	320-0487 25A	226-1510	226-1509	226-1503	226-0740	226-1005

B CHANGE W1, W2, W3, ON TAB 55 07 4-5-79

A ADDED W9 & W10 82 6-8-78

SUPERSEDES DWG SAME NO. DATED 9-24-63

LET REVISION ENGR CKR DATE

Onan DIVISION OF ONAN CORPORATION
Minneapolis, Minnesota

DATE 7-20-76 PR CIP ENGR W13 CKR

CONTROL-METER PANEL

SEPIA FROM 612-1469 DWG NO. 612-1851

SAMP REL

PROJ REL 113 7-21-76

PRCU REL

DASH NO. SEE TAB

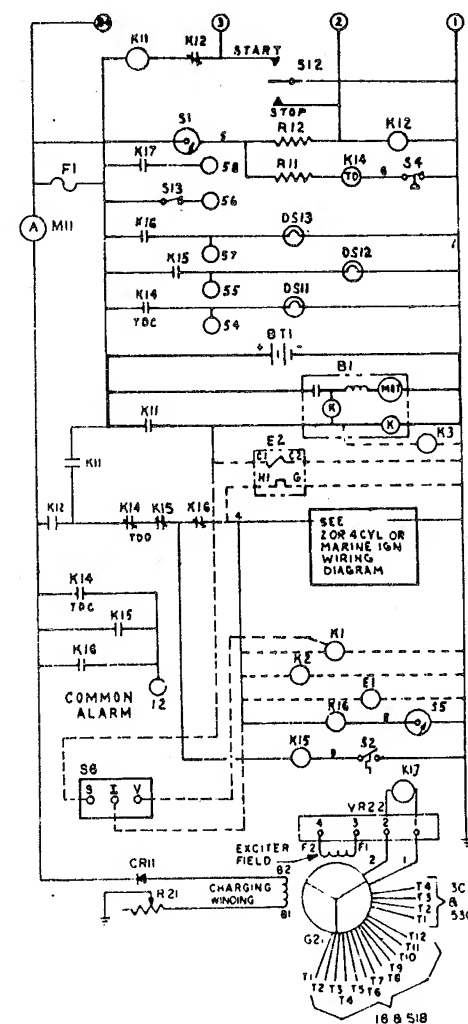
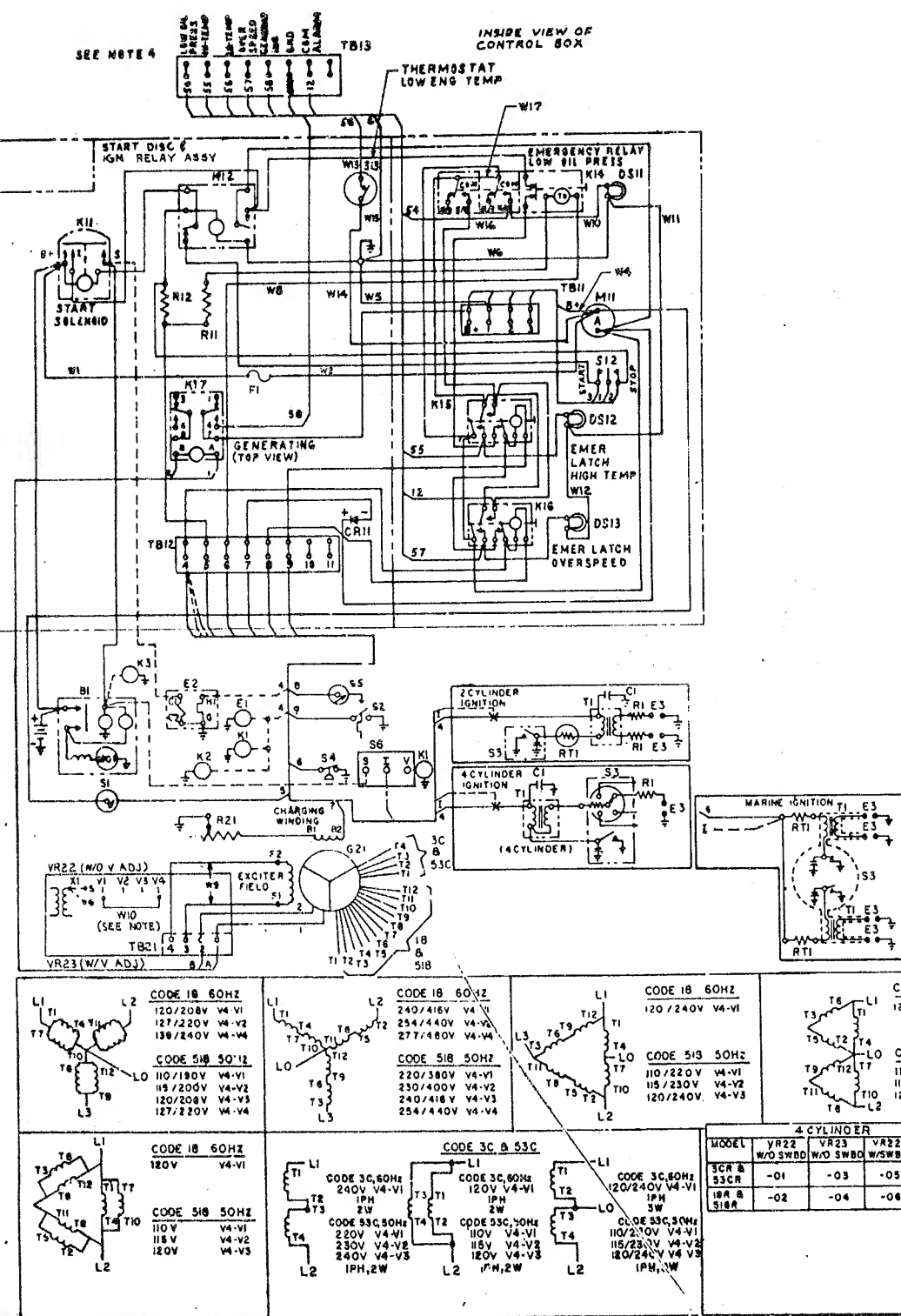
MODEL NO. 12DJC-4XR/3166A
10,12,12.5 & 15-4XR/3166J
6DJ8-4XR/3166G
7.5J8-4XR/3166G

277/480V., 3PH, 4W., 60Hz

ME 83 53 60 PARTS PO

1981-219

62-5568



NOTES

1. CONNECT LEAD WID FROM V4 TO V _
PER VOLTAGE CHART BELOW.
2. CONNECT X1 TO 5 FOR CODE 53C 515(50HZ)
CONNECT X1 TO 6 FOR CODE 3C 81(860HZ)
3. UNLESS OTHERWISE NOTED, ALL COMPONENTS
ARE SHOWN IN THE DE-ENERGIZED POSITION.
4. CONNECT 12VDC INDIVIDUAL ALARMS BETWEEN
DESIGNATED TERMINAL AND CONNECT
12VDC COMMON ALARM BETWEEN TERMINAL
12 AND GND.
(LOW TEMP NOT INCLUDED IN COMMON ALARM)
CONTACTS RATED 5 AMP AT 12VDC

W1.	336-3572	A	1	Lead Assy
W2	336-3571	A	1	Lead Assy
W4	336-1465	A	1	Lead Assy
W5	336-0172	A	1	Lead Assy
W6	226-1446	A	1	Lead Assy
W6	336-1045	A	1	Lead Assy
W10	226-1445	A	1	Lead Assy
W11	336-2634	A	1	Lead Assy
W12	338-2055	A	1	Lead Assy
W13	334-2035	A	1	Lead Assy
W14	336-2636	A	1	Lead Assy
W15	338-2531	A	1	Lead Assy
W16	336-2638	A	1	Lead Assy
W17	332-1043	C	7	Jumper

REF DES	AMTNO	QTY	DESCRIPTION
B1			STARTER & SOLENOID-ENGINE
B1			BATTERY -12V
E1			FUEL PUMP
E1			CHOKE - THERMO WAX
E1			2 SPARK PLUG (2CYL)
E1			4 SPARK PLUG (4CYL)
K1			SOLENOID-VALVE
K2			SOLENOID-VALVE TANK FUEL
R1			SOLENOID-PRIMER
R1			2 RESISTOR - SPARK PLUG (2CYL)
R1			4 RESISTOR - SPARK PLUG (4CYL)
RT1	304-0060	A	RES-HYTEMCO 172 A 25W (2CYL)
RT1	304-0060	A	2 RES-HYTEMCO 172 A 25W (MARINE)
S1			1 SWITCH-CENTRIFUGAL
S2			1 SWITCH-HIGH TEMP
S3			1 BREAKER ASSY
S3			1 SWITCH-LOW OIL PRESS
S3			1 SWITCH-OVERSPEED
Y1			1 COIL-IGNITION
Y1			2 COIL-IGNITION (MARINE)
Y1			1 SWITCH-VACUUM
AC PARTS LIST			
G21			1 GENERATOR
R21	304-0709	B	1 RESISTOR ASSY
VR22	303-0589	D	1 REGULATOR ASSY-VOLTAGE
VR22	303-0589	D	1 W/V ADJ - 02-05-06-08-09-10-12-13-14
VR23	303-0590	D	1 REGULATOR ASSY-VOLTAGE
VR23	303-0590	D	1 W/V ADJ - 03-04-07-08-11-12-15-16
	332-1043	C	1 JUMPER (K14)
	308-0001	P	1 ADAPTER-CHARGE 4-0-5
	332-0092	P	1 CLIP - WIRE
	308-0015	-	4 WASHER - FIBER
W3	338-0317	A	1 WIRING HARNESS (F - F2)
CONTROL BOX PARTS LIST			
CR11	309-0496	A	1 RECTIFIER & LEAD ASSY
DS11	322-0004	-	1 LAMP-LOW OIL PRESS
DS12	322-0004	-	1 LAMP-LOW OIL PRESS
DS13	322-0004	-	1 LAMP-OVERSPEED
DS13	322-0004	P	3 HOLDER-LAMP
K11	307-0845	B	1 RELAY-START SOLENOID
K12	307-1827	B	1 RELAY-START DISC & IGN LEAD ASSY
K14	320-0259	B	1 RELAY-EMERGENCY (LOP)
K15	307-0853	A REF	1 RELAY-EMERGENCY LATCH (HIGH TEMP)
K15	307-0853	A REF	1 RELAY-EMERGENCY LATCH (OVERSPEED)
K17	307-1515	B	1 RELAY-EMERGENCY
K17	307-1515	B	1 RELAY-GENERATOR
	323-1042	A	1 SOCKET ASSY-LEAD
	332-0943	A	2 SPRING
	307-1157	P	1 SPACER-RELAY HOLODOWN
	322-0448	A	1 TERMINAL-CHARGE 4-0-5
RT1P, S12	308-3382	B	1 SWITCH & RESISTOR ASSY
S15	309-0270	P	1 THERMOSTAT (LOW ENG TEMP)
TR11	332-0637	A	1 TERMINAL BLOCK
TR12	332-0586	A	1 MARKER STRIP
TR12	332-0778	A	1 TERMINAL BLOCK
TR12	332-0738	A	1 MARKER STRIP
TR13	332-0706	A	1 TERMINAL BLOCK
TR13	332-0707	A	1 MARKER STRIP
FI	301-0146	A	1 FUSE-10 AMP
FI	321-0175	A	1 HOLDER FUSE
	301-9547	C	1 PANEL-CONTROL BOX
	301-9562	D	1 PANEL-CONTROL BOX
	301-9714	B	1 COVER-REGULATOR
	301-1683	C	1 SADDLE-CONTROL BOX
	301-9582	C	1 OUTPUT BOX-01-02-03-04
	301-0856	C	1 COVER-01-02-03-04
	301-2467	C	1 COVER-01-03-04 THRU-16
	301-2466	A	1 COVER-03 THRU-16
	308-0183	P	1 GROMMET
	303-0070	A	4 RUBBER MOUNTS
	337-0036	A	1 GROUND STRIP
	96-2447	B	1 SILKSCREEN (TOP MTR SW & NOTE)
	96-2406	A	1 SILKSCREEN (CR 53CR-01-03-05-07-09-11-13-15)
	96-2607	B	1 SILKSCREEN (SIBR)-02-04-06-08-10-12-14-16
	307-0019	-	1 DOT BUTTON

* WHEN USED


GASOLINE		A. ADDED 98		612-5568	
6.0-12.5 KW - 53CR/1409AB		1		SERIAL	
6.0-12.5 KW - 518R/14019AB		2		SERIAL	
7.5-15.0 KW - 3CR/1409AB		3		SERIAL	
7.5-15.0 KW - 18R/14019AB		4		SERIAL	
10.0-15.0 KW - 18R/14019AB		5		SERIAL	
16.3 PH, 50&60 HZ		6		SERIAL	
		7		SERIAL	
		8		SERIAL	
		9		SERIAL	
		10		SERIAL	
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		100		SERIAL	

612-5568

612-5568

D


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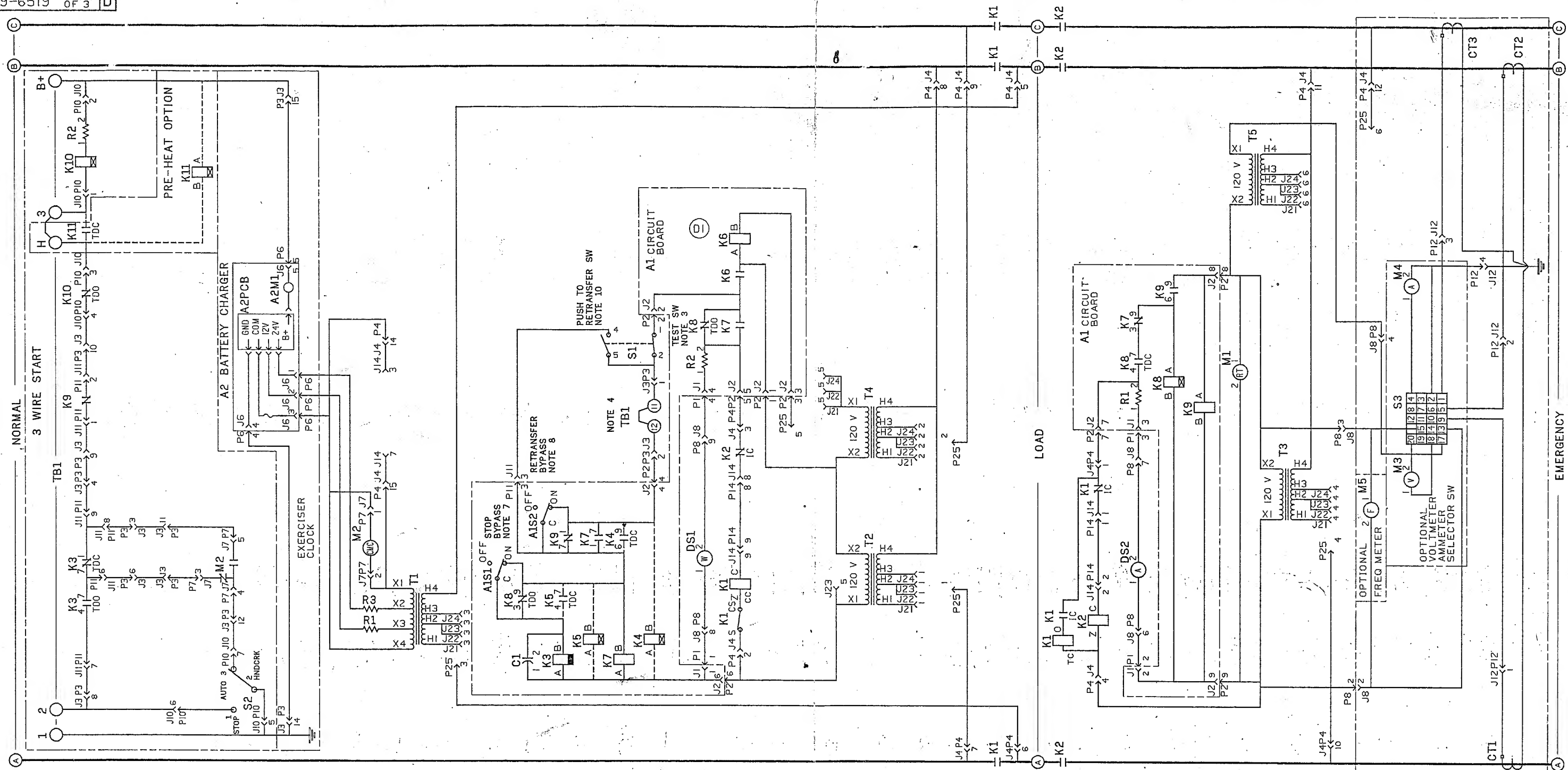
310-0357	Rel Date	Item	Part No.	*Buk	Dwg Size	Qty	Description or Material	
	Name		Date		 Onon Corporation Minneapolis, Minnesota			
	Dr. R. DAVIDOVA CORP <i>Generalist</i>		8-21-84 9-7-84 9-6-84					
	Approved <i>JT MILLER</i>		Title		OUTLINE-CONTROL BOX			
	For interpretation of conditions, see tolerancing, see notes.		Model used on		Dwg No.		Sheet	
	11 TEXT				310-0357			



- | | | |
|------|-----|----|
| 208V | 3PH | 4W |
| 240V | 1PH | 3W |
| 240V | 3PH | 4W |
| 480V | 3PH | 4W |

[illegible]

CADD SYSTEM DWG		25,789	A	1	PROD RLSE	-	WD JKJLJTM	1-24-85
		ER NO.	ULTR. INO.		REVISION	ZONE/NO.		CHKR APPROVED DATE
SMT TO		NAME		DATE		 ONAN CORPORATION MINNEAPOLIS, MINNESOTA		
SPEC'ED		GR		MARK R. DALSKE		1-24-85		
REVISED		CHKR		G.J. CONSTOCK		2-1-85		
		APPROVED		J.T. MILLER		2-1-85		
THIS DOCUMENT IS THE PROPERTY OF ONAN. IT IS TO BE KEPT IN THE OFFICE OF THE DESIGNER AND NOT TO BE REPRODUCED OR DISTRIBUTED OUTSIDE THE COMPANY WITHOUT THE WRITTEN PERMISSION OF THE DESIGNER.		TITLE		WD-AUTOMATIC XFR SW				
		DWG NO.		619-6466				
		SHEET		1 of 3				
MTL FIRST USED ON LT EXT-2 WIRE START								



NOTES:

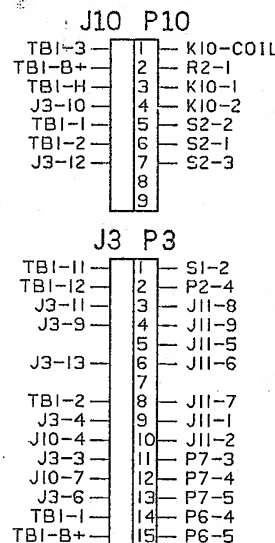
1. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION
2. ALL COILS OPERATE ON 120 VAC EXCEPT K10
3. AFTER TEST OR EXERCISE WITH LOAD PLANT WILL RUN FOR DURATIONS OF TIME DELAYS
4. TO ADD AREA PROTECTION EQUIPMENT OR REMOTE TEST SWITCH, REMOVE JUMPER BETWEEN TB1-11 AND TB1-12
5. WHEN REMOVING J3, J4 OR J10 PLUG, SELECTOR SWITCH ON PLANT OR L.T. MUST BE IN STOP POSITION OR GENERATOR WILL START AND RUN
6. TRANSFER SWITCH MECHANICALLY HELD LINE SIDE
 - IC - INTERLOCK CONTACT
 - TC - TRIP COIL
 - CS - COUTOUT SWITCH
 - CC - CLOSING COIL
7. AIS1 IS THE TIME DELAY STOPPING BYPASS SW IF CONTROL IS EQUIPPED WITH A TIME DELAY STOPPING THIS SWITCH MUST BE OPEN, OTHERWISE THIS SWITCH IS CLOSED
8. AIS2 IS THE TIME DELAY RETRANSFER BYPASS SW IF CONTROL IS EQUIPPED WITH A TIME DELAY RETRANSFER THIS SWITCH MUST BE OPEN, OTHERWISE THIS SWITCH IS CLOSED
10. PUSH TO RETRANSFER MANUALLY BYPASSES THE TIME DELAY RETRANSFER TIMER

208V	3PH	4W
240V	1PH	3W
240V	3PH	4W
480V	3PH	4W

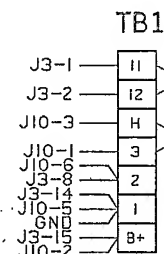
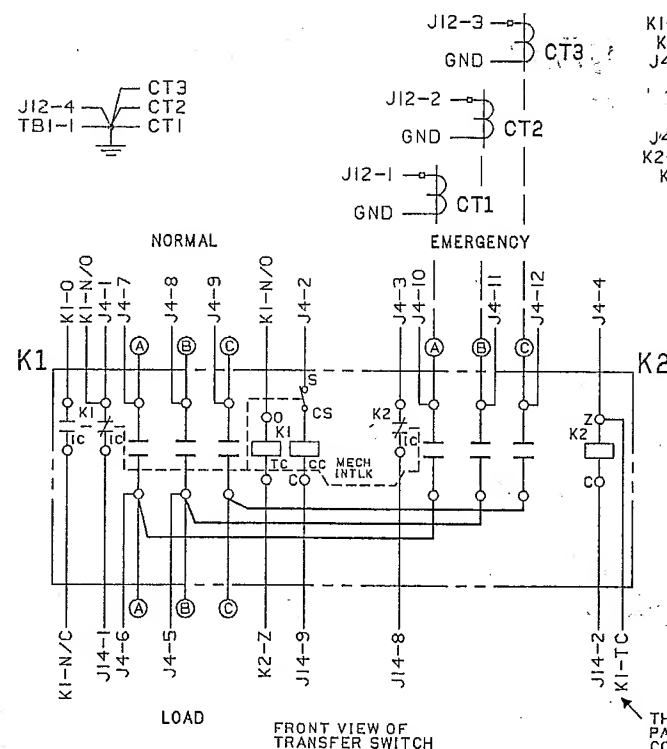
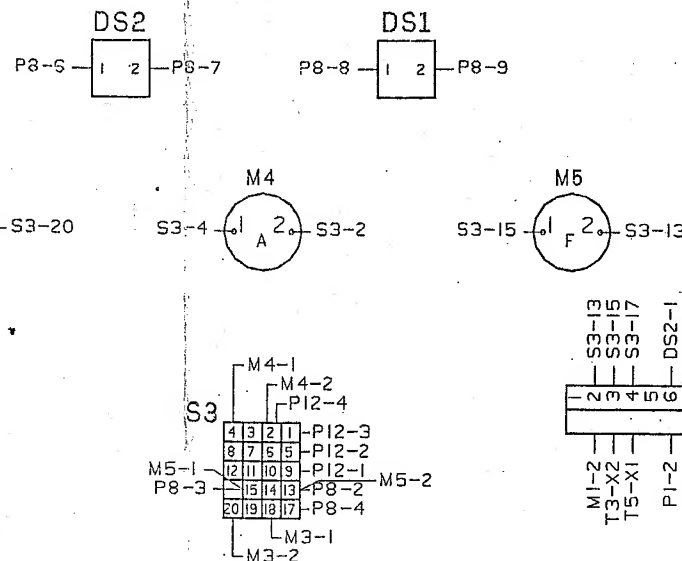
3 OF 3

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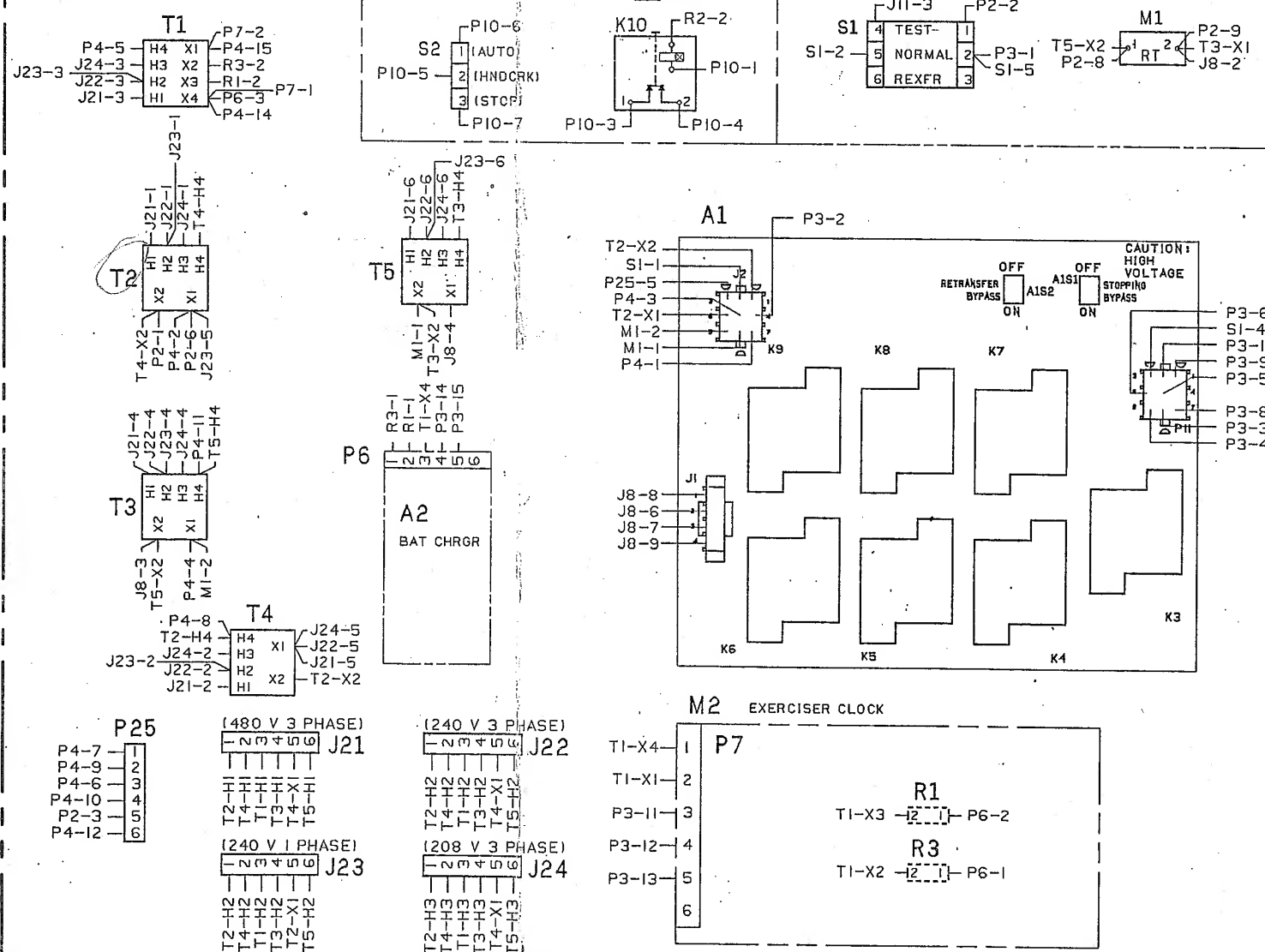
INSIDE VIEW OF CABINET



3 WIRE START

TO REMOTE
TEST SW
REMOVE
JUMPERTO REMOTE
TERMINAL
BLOCK ON
PLANTINSIDE VIEW OF DOOR
EMERGENCY NORMAL

CONTROL PANEL



THIS PAGE FOR REF ONLY

		CONTROL CODE									
REF DES	PART NO	QTY	260	261	262	263	264	265	266	DESCRIPTION	
K3	307-1127 307-2197	B B	I I	X X		X X	X X	X X	X X	RELAY-START RELAY-TIME DELAY (STARTING) .1 TO 10 SEC ON DE-ENERGIZATION	
K4	307-2195	P	I		X	X	X	X	X	RELAY-TIME DELAY (RETRANSFER) 2 TO 30 MIN ON ENERGIZATION	
K5	307-1928	C	I				X	X	X	RELAY-TIME DELAY (STOPPING AFTER RETRANSFER) 3 TO 300 SEC ON ENERGIZATION	
K6	307-1127 307-2494 307-2531	B P P	I I I	X X X	X X X	X X X	X X X		X	RELAY (PHASE SENSOR) RELAY (VOLTAGE SENSOR) 3PH LINE SIDE RELAY (VOLTAGE SENSOR) 1PH LINE SIDE	
K7	307-1127	B	I	X	X	X	X	X	X	RELAY (INSTANT TRANSFER TO LINE)	
K8	307-1127	B	I	X	X	X	X			RELAY-TIME DELAY (TRANSFER)	
	307-2199	B	I					X	X	RELAY-TIME DELAY (TRANSFER) .3 TO 30 SEC ON ENERGIZATION	
K9	307-2531	P	I	X	X	X	X	X	X	RELAY (VOLTAGE SENSOR) 1PH GEN SIDE	

REF DES		PART NO	QTY	METER CODE					DESCRIPTION
				02	03	04	05		
CT1,2,3	SEE NOTE 12	B	3		X			TRANSFORMER-CURRENT	
	SEE NOTE 12	B	3		X			TRANSFORMER-CURRENT	
	SEE NOTE 12	B	1		X			AMMETER-AC	
M4	SEE NOTE 12	B	1		X			AMMETER-AC	
	SEE NOTE 12	B	1	X	X			VOLTMETER-AC	
M5	SEE NOTE 12	B	1		X				
M6	SEE NOTE 12	B	1		X			METER-FREQUENCY	
S5	308-0670	P	1	X	X		X	SWITCH-ROTARY (VOLT & AMP)	
	301-8755	A	1	X	X			BRACKET ASSY-SSCRN	

NOTE:
12. THIS PART NUMBER CHANGES FROM ASSY TO ASSY
BASED ON VOLTAGE,FREQUENCY AND AMPERAGE.
SEE TOP LEVEL DRAWING FOR PROPER PART NO.

REF DES	PART NO	QTY	PARTS LIST		DESCRIPTION
			SIZE	QTY	
A1	300-2939	D	1		PCB ASSY-XFR SW CONT
A2	300-2957	C	1		BATTERY CHARGER-ASSY
	300-2946	D	1		PCB ASSY-BATTERY CHG
	302-0807	A	1		AMMETER-DC
	321-0175	P	1		HOLDER-FUSE
	321-0174	P	1		FUSE-5 AMP
DS1	322-0382-02	P	1		LAMP-HOUSING (GREEN)
DS2	322-0382-01	P	1		LAMP-HOUSING (RED)
K1,K2	SEE NOTE 12	C	1		TRANSFER SWITCH
	SEE NOTE 12	C	1		TRANSFER SWITCH
	307-2234	P	1		LATCH-MECHANICAL
K10	320-0104	B	1		RELAY-CRANKING LIMITER
M2	300-2493	C	1		CLOCK EXERCISER-ASSY
	307-2177	P	1		SWITCH-TIME (PART OF M2 ASSY)
R1	304-0139	A	1		RESISTOR,2.5 OHM,25 WATT
R2	304-0775	A	1		RESISTOR,3 OHM,10 WATT
R3	304-0037	A	1		RESISTOR,6 OHM,75 WATT
M3	302-1167	P	1		METER-TIME TOTALIZING
S1	308-0802	P	1		SWITCH-TEST,NORMAL,RETRANSFER
S2	308-0771	P	1		SWITCH-SELECTOR (AUTO,HNDCRNK,STOP)
T1	SEE NOTE 12	P	1		TRANSFORMER-CONTROL
T2,3	SEE NOTE 12	P	2		TRANSFORMER-CONTROL
T4,5	SEE NOTE 12	P	2		TRANSFORMER-CONTROL
TB3	332-2025	A	1		TERMINAL BLOCK
	332-2760	A	1		MARKER STRIP
	338-1881	D	1		HARNESS-3 WIRE START

208V	3PH	4W
240V	1PH	3W
240V	3PH	4W
480V	3PH	4W

CADD SYSTEM DWG

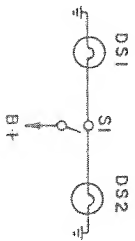
SIN TO	NAME	DATE	ONAN CORPORATION
COPIED	MARK R. DALSKE	1-18-85	MINNEAPOLIS, MINNESOTA
PROJ	CHKR G.J. COMSTOCK	2-1-85	
	APPROVED J.T. MILLER	2-1-85	
	MODEL FIRST USED ON		
	LT EXT-3 WIRE START		

WD-AUTOMATIC XFR SW

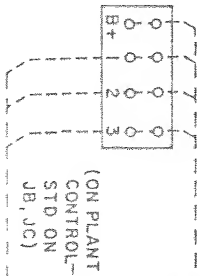
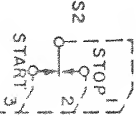
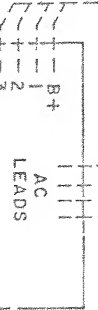
619-6519

3 of 3

612-1543

Dwg
Size
B

(REAR VIEW OF HOUSING)

TO GEN OR
METER PANEL

(OUTPUT BOX ON GEN)

NOTES:

1. WITH METER PANEL
 - 1.1 USE DS1, DS2, S1, S2, W1, W2
 - 1.2 MOUNT S2 IN TOP HOLE
2. WITHOUT METER PANEL
 - 2.1 USE S2, W1, W2
 - 2.2 MOUNT S2 IN RIGHT HOLE
3. DS1, DS2 AND S1 ARE MOUNTED ON HOUSING
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN THE DE-ENERGIZED POSITION

MODEL	WITH METER PANEL	WITHOUT METER PANEL
JB-12V	-01	-02
JB-24V	-03	-04
JB, JC-12V	-05	-06
JB, JC-24V	-07	-08

53	89	50	53	89	50
✓	✓	✓	✓	✓	✓
DASH NO.			DASH NO.		
53			53		
89			89		
50			50		

JB & JC (HOUSED)

2567	A	RE-DRAWN FOR LEGIBILITY	1/1	1/1	1/1
ER NO.	1/1	SUPERSEDES, DWG SAME NO DATED 2-5-69	1/1	1/1	1/1
DATE	4-6-76	BY	JC	CHK	JC
DIVISION OF ONAN CORPORATION Minneapolis, Minnesota					

DATE	4-6-76	BY	JC	CHK	JC
CONTROL GEN-ENG (HOUSING) (WIRING DIAGRAM)					
SERIAL FROM	6	6	6	6	6
612-1543					B

PARTS LIST (SEE NOTES)

REF DES	PART NO.	QTY	DESCRIPTION
DS1, 2	322-0004	2	LAMP (12 VOLT)
	322-0017	2	LAMP (24 VOLT)
	322-0072	2	HOLDER-LAMP (REF)
S1	322-0082	1	PANEL LIGHT ASSY
	308-0002	1	SWITCH-PANEL LIGHT (REF)
S2	308-0154	1	SWITCH-START-STOP
	98-1144	1	SILKSCREEN
W1	338-0495	1	HARNES-REMOTE
W2	338-0305	1	HARNES-START-STOP

3451-219



Standby Power Inc.

TERMS: Net 30 days, following date of purchase.
A LATE PAYMENT CHARGE of 1½ % per month (18% per annum)
will be assessed on any past due balance.

☐ REDFORD
☒ GRAND RAPIDS

SOLD TO Western Mich. University A/C NO. _____

ADDRESS Purchasing Dept

Kalamazoo, MI 49008-5167

212972

REFER TO:
627749H

SHIP TO Receiving 1201 O'Brien St.

ADDRESS CompuLink Service Building

PARTS LISTED _____

TRANSACTION TYPE: _____

CASH ☐

CHARGE ☐

OTHER Other ACCT. _____

SALESMAN OR CLOCK NO. DD PKG. BY _____ CUSTOMER PURCHASE ORDER NO. _____ DATE 1-6-93 SHIP VIA Over Truck

ORDERED	S.O.	SHIPPED	PART NUMBER	TYPE	DESCRIPTION	UNIT PRICE	AMOUNT
1		1	K92049324		12.5JC-G/134HAB		
1		1	2 307-0312		polished Valve		
1		1	3 503-0310		High Fuel		
1		1	4 147-0558		Stroker		
			5				
			6				
			7				
			8				
			9				
			10		Shipping Here Only		
			11				
			12				

TOTALS _____

ATTENTION:

THE PARTS AND OTHER ITEMS COVERED BY THIS INVOICE ARE SUBJECT TO THE TERMS OF THE STANDBY POWER, INC. WARRANTY: A COPY OF WHICH IS PRINTED ON THE REVERSE SIDE OF THE CUSTOMER COPY OF THIS FORM. AMONG OTHER THINGS, THE WARRANTY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND EXCLUDES CONSEQUENTIAL DAMAGES. BY YOUR ACCEPTANCE OF THE PARTS AND OTHER ITEMS HEREUNDER, YOU AGREE THAT YOUR SOLE REMEDY AGAINST STANDBY POWER, INC. FOR ANY LOSS ARISING OUT OF A DEFECT IN DESIGN, MATERIAL OR WORKMANSHIP OF A PRODUCT COVERED BY THIS INVOICE SHALL BE THE REMEDY PROVIDED IN SUCH WARRANTY AND NO OTHER.

All parts returned undamaged, if accepted, will be credited less handling charges.

All returns must be accompanied by Packing List.

REC'D. BY _____

PACKING LIST



TRANSFER SWITCH

INDUSTRIAL PRODUCT TEST RECORD

Model		S/N
Customer		Order File Number
Test Voltage	Test Frequency	Test Date
Assembled By	Test Station	Tested By

ITEMS CHECKED / ADJUSTED

<input type="checkbox"/> Gen. Start Time Delay*	<input type="checkbox"/> Battery Charger Operation	<input type="checkbox"/>
<input type="checkbox"/> Transfer Time Delay..*	<input type="checkbox"/> Exerciser Clock Operation	<input type="checkbox"/>
<input type="checkbox"/> Retransfer Time Delay*	<input checked="" type="checkbox"/> Time Meter Operation	<input type="checkbox"/>
<input type="checkbox"/> Gen. Stop Time Delay.*	<input type="checkbox"/> Program Transition Oper.	<input type="checkbox"/>
<input type="checkbox"/> Under Voltage (Line).*	<input checked="" type="checkbox"/> 2 to 3 Wire Convertor Oper.	<input type="checkbox"/>
<input type="checkbox"/> Under Voltage (Emer).*	<input type="checkbox"/> Voltmeter Operation	<input type="checkbox"/>
<input type="checkbox"/> Over Voltage (Line)..*	<input type="checkbox"/> Ammeter Operation	<input type="checkbox"/>
<input type="checkbox"/> Over Voltage (Emer)..*	<input type="checkbox"/> Frequency Meter Operation	<input type="checkbox"/>
<input type="checkbox"/> Switch Load to Line	<input type="checkbox"/> Auxiliary Relays Operation	<input type="checkbox"/>
<input type="checkbox"/> Switch Load to Emer	<input type="checkbox"/> Signal Module Operation	<input type="checkbox"/>
<input type="checkbox"/> Lights and Switches	<input type="checkbox"/> Auto/Manual Retransfer Switch	<input type="checkbox"/>

*These functions are expected to be set on site to meet the specific requirements of the application. Consult the Operators Manual for the set points of these features.

Comments:

Quality Engineer

Quality Manager

Model

ATFV 60L 306 H

Set

D900316255

Options

A005 B001 C003 400 8000

WIR. PIN

619-6519

Onan

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